Appendix A

The following discussion includes those projects requiring explanation beyond the summaries provided in Chapter 1 for ranking, sampling plan development, chemical testing, biological testing, or those for which the DMMP agencies used best professional judgement.

Dredging Year 2000

USACE Olympia Harbor Maintenance Dredging. The Corps of Engineers and the Port of Olympia proposed to dredge approximately 635,000 cubic yards of sediment from Olympia Harbor. There were no exceedances of 1999 DMMP screening levels for the standard list of chemicals of concern for the Olympia Harbor Maintenance project. A tiered approach was used in the analysis for Tributyltin (TBT). Composites in the berthing are (B1 and B2) were analyzed for TBT. If there were no TBT exceedances in these samples, TBT testing would not be required for the rest of the samples. Composite B1 had a porewater TBT level of 0.28 ug/L, above the screening level of 0.15 ug/L. This exceedance triggered the requirement to test all remaining DMMUs for TBT. One of these DMMU also exceeded the screening level for TBT (TBW-1). DMMU exceeding the screening level for TBT are required to undergo bioaccumulation testing in order to determine suitability for open-water disposal.

A separate sampling and analysis effort was undertaken for the bioaccumulation testing of samples B1 and TBW-1. A sampling plan addendum was approved by the agencies in July 1999. Sampling for TBT bioaccumulation analysis was completed in August 1999.

Bioaccumulation testing was performed with bivalve *Macoma nasuta* and the polychaete *Nephtys caecoides*. The two species were tested together in the same 18-liter glass aquarium. At the time of project initiation, the standard DMMP bioaccumulation protocol called for 28-day test duration. The project proponents agreed to extend the test to 45 days, based on the recommendation of the DMMP agencies. The extended test provides a better approximation of steady-state tissue concentrations for TBT.

Six replicate aquaria (five test replicates and one replicate for steady state monitoring) were run for the two test sediments, the two reference sediments and the negative control.

Tissue concentrations from the 45-day exposure were compared to the reference sediments. Initial sediment chemistry was used to adjust the observed tissue concentrations. The sediment chemistry results between the first and second rounds of TBT testing differed, and so a ratio of the two was used to adjust the bioaccumulation tissue concentrations to reflect a "worst case" analytical result. These TBT chemistry results are as follows: DMMU B1

Initial (4/99) .28(?g/L), retest (8/99) 00.14 (?g/L), ratio I/R 2.0; DMMU TBW1: Initial (4/99) 0.16 (?g/L), retest (8/99) 0.02 (?g/L), ratio I/R 8.0.

The DMMP agencies agreed to use the target tissue level developed for the East Waterway project, 3 ppm dry weight of TBT in tissue, as the value appropriate for the Olympia Harbor Navigation Project. Given the limited residue-effects data for the Olympia area, it was determined that the number calculated for Elliott Bay would be the closest approximation available for making a determination of suitability. The method of calculation and the data supporting this value is documented in the suitability determination for the East Waterway project suitability determination (1999), paragraph 18, and in the "Review of Tissue Residue Effects Data for Tributyltin, Mercury and Polychlorinated Biphenyls", prepared by EVS solutions for the Port of Seattle.

TBT concentrations in tissues from *Macoma* and *Nephtys* exposed to test sediments were significantly less than the target tissue level of 3 ppm dry weight TBT in tissue. TBT tissue concentrations were also compared to reference and significant differences were observed for both DMMU. The DMMP agencies agreed that comparing statistical difference from reference is a necessary but not a sufficient condition to determine a DMMU unsuitable for open-water disposal. Sediments from these two DMMU are suitable because all TBT tissue concentrations are significantly less than the target tissue level, TBT is undetected in most test replicates and differs from reference only when conservative assumptions are applied to non-detected values, and TBT concentrations in the retested samples were all lower than the screening level.

East Waterway Stage II Project. The East Waterway Project was located in the high ranked lower Duwamish Waterway. The use of best professional judgement for this project was exercised during bioaccumulation testing. The bioassay testing results were relatively routine and will not be discussed here.

Of the 49 DMMUs that had bioaccumulation trigger (BT) exceedances 25 (including S-23) passed the DMMP bioassays interpretation guidelines for open-water-unconfined disposal during Phase 1 testing. **Table A-1** (also see **Appendix C**) highlights the 25 DMMUs and chemicals exceeding BTs that were subject to bioaccumulation testing during Phase 2.

The sediment analytical results for the initial and resampled/retested sediment for the 25 DMMUs requiring bioaccumulation testing are presented in **Table A-1**. The results of these sediment analyses indicated that there was often a large disparity between the Phase 1 and Phase 2 analytical results for the COCs that exceeded the BTs. When sediment chemistry results from Phase I testing exceeded those from Phase II, the ratio of the two was used to adjust the bioaccumulation tissue concentrations to reflect a "worst case" analytical result. In the cases where the ratio was less than 1 (Phase 1 < Phase II), no adjustments were made to the tissue concentration. Conventional sediment

parameters were also reanalyzed for the 25 DMMUs and indicated the sediment characteristics were largely similar between Phase 1 and 2.

As noted above, only 25 of 49 DMMUs with one or more BT exceedances in Phase 1 testing were subjected to bioaccumulation testing. The remaining 24 DMMUs failed Tier III bioassay testing and no additional testing (e.g., bioaccumulation) was required to complete the suitability determination.

Bioaccumulation testing was performed with *Macoma nasuta*, a facultative deposit feeding/suspension feeding bivalve and *Nephtys caecoides*, a burrowing facultative deposit feeding/carnivorous polychaete. The two species were tested together in the same 8-gallon aquaria. The standard PSDDA bioaccumulation test duration is 28 days. However, to provide a better approximation of steady-state tissue concentrations for the tested chemicals (TBT, Fluoranthene, total DDT, and total PCBs), the applicant (Corps of Engineers/Port of Seattle) agreed to extend the exposure period to 45 days based on the recommendation of the DMMP agencies. The actual test was terminated at 44 days due to an increased rate of mortalities among the test species near the end of the test period.

Table A-1. DMMUs with bioaccumulation trigger exceedances.

DMMUs > BT	Sediment Concentrations exceeding BT			
	TBT **BT = 0.15** ?g/liter (porewater) Initial / Retest (I/R Ratio)	**Fluoranthene** **BT = 4,600** ?g/kg-DW Initial / Retest (I/R Ratio)	**Total DDT** **BT = 50** ?g/kg-DW Initial / Retest (I/R Ratio)	**Total PCBs** **BT = 38** mg/kg-OC norm.-DW Initial / Retest (I/R Ratio)
S4	0.18 / 0.11 (1.64)			
S5	0.31 MB / 0.09 (3.4)			103 / 53 (1.94)
S6	0.15 MB / 0.08 (1.9)			50 / 21 (2.4)
S7	0.19 MB / 0.09 (2.1)			
S8	0.17 M / 0.24 (0.7)			
S9				48 / 103 (0.46)
S10				42 / 329 (0.13)
S11			51 U / 47 (1.1)	**127 / 42 (3.0)**
S13				44 / 82 (0.54)
S14				56 / 98 (0.57)
S16			58 UJ / 61 (0.95)	**77 / 44 (1.75)**
S19				45 / 44 (1.02)
S21	0.15 M / 0.17 (0.9)			90 / 60 (1.5)
S23	0.28 J / 0.22 (1.3)		98 U / 43 (2.28)	**212 / 81 (2.6)**
S31	**0.35 B / 0.51 (0.6)**			
S39	0.23 M / 0.77 (0.3)			
S40	0.19 M / 1.05 (0.18)			
S41	0.23 M / 0.18 (1.3)			
S43	0.21 MB / 0.12 (1.75)			
S46	0.22 / 0.38 ((0.58)			
S47	0.83 / 4.0 (0.21)			
S49	0.25 MB / 0.24 (1.04)			38 / 90 (0.42)
S50	0.19 B / 0.12 (1.6)	6,400 / 800 (8.0)		88 / 41 (2.15)
S52	0.20 M / 0.17 (1.2)			
S57	0.92 MB / 0.47 (1.96)			

Legend: DW = dry weight; OC = organic carbon normalized value; M = estimated value; B = possible blank contamination; J = estimated value; U = Undetected at reported concentration; UJ = analyte not detected above the reported sample quantitation limit; Shaded cells denote DMMU's failing bioaccumulation test interpretation guidelines, which are discussed in text; I/R Ratio = highlighted yellow value: ratio of initial/retested for tested analyte.

Five replicate 8-gallon aquaria were run for the negative control, for each of the 3 reference sediments, and for each of the 25 tested DMMUs. In addition to the routine water quality metrics (temperature, salinity, dissolved oxygen, pH) that were monitored during the exposure period, the DMMP agencies recommended and the applicant agreed to collect an additional metric, wet-weight growth, during the exposure period to further assess the general health and well-being of the test animals. The results of growth and survival measurements taken for each species during the exposure period suggested

that for *Macoma nasuta* there was no apparent relationship between mean growth and survival during the exposure period. The results for *Nephtys caecoides* indicated there was a statistically significant ($p<0.01$) negative effect on survival with a reduction in mean growth during the exposure period.

Tissue concentrations of chemicals-of-concern from the 44-day exposures were compared statistically to the appropriate reference sediment, based on grain size similarity comparisons. As noted above, the calculated ratios of Phase 1 (initial)/Phase II (retest) sediment chemistry were used to adjust the observed tissue concentrations. Statistical comparisons of test DMMUs and reference tissue concentrations for the final interpretation "worst case" analyses were based on the adjusted tissue concentrations. The summary tissue chemistry interpretation for each of the measured chemicals is provided in **Table A-2** for each of the 25 DMMUs tested.

The DMMP agencies agreed that comparing statistical differences from reference is a necessary, but not sufficient condition to determine a DMMU unsuitable for open-water disposal. For those DMMUs that were statistically greater than reference, a more in depth evaluation was required to determine the significance of the bioaccumulation that had occurred. This evaluation focused on **a)** Food and Drug Administration (FDA) Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food; **b)** PSDDA target tissue concentration values for chemicals of concern to human health, and **c)** ecological residue-effects data from the literature.

a) The FDA guidelines for the chemicals of concern addressed by East Waterway Stage II bioaccumulation testing are as follows:

Tributyltin (TBT):	No guideline
Fluoranthene:	No guideline
DDT + DDE:	5.0 ppm wet weight (ww)
PCBs:	2.0 ppm ww

b) A risk-based approach was adopted by the PSDDA program in 1988 to set target tissue levels (TTL) for human health. The TTL calculated for **fluoranthene** based on risk to humans consuming seafood is **8,400 ppm wet weight**.

As part of a suitability determination for the Port of Seattle T-18 dredging project (March 17, 1997 SDM), the PSDDA agencies re-evaluated the human health-based TTLs for PCBs, total DDT, mercury, and TBT. In recalculating these TTLs, the PSDDA agencies used updated cancer slope factors and reference doses, as well as estimates of fish home range. The TTL developed for **total DDT is 44 ppm wet weight.**

The DMMP agencies recently undertook a re-evaluation of the PCB TTL for human health. Recalculation of the PCB TTL for the Elliott Bay disposal site included using an updated cancer slope factor, recent fish consumption data, and consideration of PCB biomagnification due to trophic transfer. Based on this analysis, **an interim TTL for total PCBs (Aroclor) of 0.75 ppm wet weight** has been used to interprete bioaccumulation data from the East Waterway Phase II Project.

A recent effort by the Port of Seattle (May 1999)[1] involved compilation of the residue-effect literature for TBT. It was prepared for the Port of Seattle by EVS Solutions for submittal to the U.S. Environmental Protection Agency for the Harbor Island Superfund Site, Waterway Sediment Operable Unit. Using residue-effects data from this and other studies, EPA Superfund developed a tissue trigger level of 3 ppm dry weight of TBT in tissue (0.6 ppm wet weight) that was used to evaluate bioaccumulation data from the West Waterway OU (for more information see Appendix D of the May 1999 EVS report). This tissue concentration is protective for growth and reproduction endpoints in polychaetes, crustaceans, bivalves, and most gastropods. However, it might not protect the most sensitive species of meso- and neogastropods against imposex-related sterility. Considering that meso- and neogastropods are rare in Elliott Bay (Appendix D in EVS, 1999), the DMMP agencies have decided to use the West Waterway **TBT trigger level (3 ppm dry weight)** on an interim basis to interpret bioaccumulation relative to disposal at the Elliott Bay site.

To summarize, the DMMP agencies used the following TTLs to interpret the bioaccumulation test data for the East Waterway Stage II Project:

TBT:	3.0 ppm dry weight (dw) as TBT
Fluoranthene:	8,400 ppm ww
DDT + DDE:	3.0 ppm ww
PCB:	0.75 ppm ww

The agencies used best professional judgement in developing these interpretation guidelines to meet PSDDA disposal site management objectives; achievement of other sediment management objectives will require additional evaluation. These guidelines are subject to change for future PSDDA/DMMP projects as additional bioaccumulation data become available.

Each DMMU was compared to these interpretation guidelines using a one-tailed one-sample t-test (see **Table A-2**). An alpha level (the probability of making a Type I error, rejecting the null hypothesis of no difference between test and

[1] For TBT, the DMMP agencies relied upon Appendix D of a May 1999 report entitled: "Review of Tissue Residue Effects Data for Tributyltin, Mercury, and Polychlorinated Biphenyls". Prepared by EVS Solutions for the Port of Seattle.

reference responses when, in fact, they are not different) of 0.1 was selected for these statistical comparisons by the DMMP agencies to reflect the higher within sample variability, and to increase the power of the test to discriminate between reference and test responses. DMMU S23 exceeded the interim PCB target tissue level (TTL) and thus failed the bioaccumulation test. Because S23 (ML Rule exceedance) failed the bioaccumulation test for PCBs, further testing under a Tier IV evaluation is unnecessary to make a suitability determination. Two additional DMMUs, S11 and S16 statistically exceeded the interim PCB TTL, and also failed the bioaccumulation test. DMMU S31 exceeded the interim TBT TTL and therefore failed the bioaccumulation test. No other DMMUs statistically exceeded the bioaccumulation interpretation guidelines. In summary, of the 25 DMMUs tested representing 95,340 cubic yards, 4 DMMUs failed the bioaccumulation test representing a total volume of 15,680 cubic yards.

Chemical/biological testing conducted for a portion of the East Waterway Stage II Project surfaced subsurface contamination issues that will require further examination of the subsurface sediment quality (e.g., Z-sample collection and analysis) of the proposed new-sediment surface following dredging to verify compliance with Washington State's antidegradation statute. These analyses have not yet been conducted and must be completed before dredging of those identified DMMUs can be conducted.

Table A-2. Worst Case Bioaccumulation Interpretation Summary (Adjusted values)

DMMU S4

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (CR-23 Mod)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (CR-23 Mod)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	146	239	33.4	yes	yes	46.2	75.8	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

DMMU S5

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (CR-23 Mod)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (CR-23 Mod)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	38.6	133	33.4	no	yes	103	354	65.0	yes	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	334	441	9.88	yes	yes	607	802	15.9	yes	yes

DMMU S6

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (CR-23 Mod)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (CR-23 Mod)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	29.4	55.3	33.4	no	yes	116	218	65.0	yes	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	189	511	9.88	yes	yes	196	529	15.9	yes	yes

DMMU S7

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (CR-23 Mod)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (CR-23 Mod)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	41.4	87.4	33.4	no	yes	38.6	81.5	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

DMMU S8

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (CR-23 Mod)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (CR-23 Mod)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	107	107	33.4	no	yes	31.2	32.2	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

DMMU S9

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (SB-Mac Control)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (SB-Mac Control)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000										
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	340	340	17.2	yes	yes	615	615	17.3	yes	yes

DMMU S10

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (SB-Mac Control)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (SB-Mac Control)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000										
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	398	398	17.2	yes	yes	750	750	17.3	yes	yes

DMMU S11

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (SB-Mac Control)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (SB-Mac Control)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000										
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000	16.5	18.0	0.44	yes	yes	21.5	23.4	0.76	yes	yes
Total PCBs	ug/kg-ww	750	490	1,532	17.2	yes	no	651	2,036	17.3	yes	no

DMMU S13

CHEMICAL NAME	Units	Guideline	Macoma nasuta: DMMU tissue (Initial)	Macoma nasuta: DMMU tissue (adjusted)	Macoma nasuta: Reference (SB-Mac Control)	Macoma nasuta: Statistically different from reference	Macoma nasuta: statistically below guideline	Nephtys caecoides: DMMU tissue (Initial)	Nephtys caecoides: DMMU tissue (adjusted)	Nephtys caecoides: Reference (SB-Mac Control)	Nephtys caecoides: Statistically different from reference	Nephtys caecoides: statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000										
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	217	217	17.2	yes	yes	471	471	17.3	yes	yes

Note: (1) All tissue concentrations for Fluoranthene, Total DDT and Total PCBs were converted to wet weight to facilitate guideline comparisons. All TBT tissue concentrations are on a dry weight basis.
(2) Adjustments to tissue concentrations based on initial sediment versus retested sediment concentration ratios (see Appendix 5). Concentration ratios greater than 1 were adjusted. Concentration ratios less than 1 were not adjusted.

Table A-2. Worst Case Bioaccumulation Interpretation Summary (Adjusted values)

			DMMU S14										DMMU S16										DMMU S19									
			Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000																														
Fluoranthene	ug/kg-ww	8,400																														
Total DDT	ug/kg-ww	3,000											18.4	18.4	0.44	yes	yes	36.2	36.2	0.76	yes	yes										
Total PCBs	ug/kg-ww	750	385	385	17.2	yes	yes	800	**800**	17.3	yes	yes	507	**994**	17.2	yes	**no**	912	**1,787**	17.3	yes	**no**	233	238	9.88	yes	yes	437	446	15.9	yes	yes

			DMMU S21										DMMU S23										DMMU S31									
			Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (SB-Mac Control)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	Statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	51.8	51.8	37.9	no	yes	132	132	89.0	yes	yes	20.4	25.9	37.9	no	yes	127	161.3	89.0	no	yes	**3,420**	**3,420**	20.3	yes	**no**	630	630	72.9	yes	yes
Fluoranthene	ug/kg-ww	8,400																														
Total DDT	ug/kg-ww	3,000											27.5	62.6	0.44	yes	yes	54.2	124	0.76	yes	yes										
Total PCBs	ug/kg-ww	750	315	337	17.2	yes	yes	577	618	17.3	yes	yes	780	**1,561**	17.2	yes	**no**	1,575	**3,150**	17.3	yes	**no**										

			DMMU S39										DMMU S40										DMMU S41									
			Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides					Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 W)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	DMMU tissue (adjusted)	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	134	134	33.4	yes	yes	45.7	45.7	65.0	no	yes	284	284	20.3	yes	yes	57.8	57.8	72.9	no	yes	222	284	33.4	yes	yes	44.2	56.6	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400																														
Total DDT	ug/kg-ww	3,000																														
Total PCBs	ug/kg-ww	750																														

Table A-2. Worst Case Bioaccumulation Interpretation Summary (Adjusted values)

			DMMU S43									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	71.6	91.6	33.4	no	yes	73.0	93.4	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

			DMMU S46									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	1,220	1,220	33.4	yes	yes	294	294	65.0	yes	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

			DMMU S47									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	1,780	1,780	33.4	yes	yes	352	352	65.0	yes	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

			DMMU S49									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	108	112	33.4	no	yes	82.4	85.7	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	246	246	9.88	yes	yes	590	590	15.9	yes	yes

			DMMU S50									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	158	250	33.4	yes	yes	86.6	137	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400	88.8	710	3.22	yes	yes	118	941	1.06	yes	yes
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750	246	523	9.88	yes	yes	364	**775**	15.9	yes	yes

			DMMU S52									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	67.6	79.8	33.4	no	yes	50.2	59.2	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

			DMMU S57									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	194	380	33.4	yes	yes	61.4	120	65.0	no	yes
Fluoranthene	ug/kg-ww	8,400										
Total DDT	ug/kg-ww	3,000										
Total PCBs	ug/kg-ww	750										

Target Tissue Guideline exceeded

U.S. Navy Puget Sound Naval Shipyard (PSNS) Pier Construction and Dredging Project. The PSNS project was located in the high ranked Sinclair Inlet within a Superfund cleanup site footprint. The following biological testing summary covers the use of best professional judgement exercised by the DMMP agencies during sediment testing for this project.

During Phase I testing, the Navy elected to conduct concurrent bioassay testing on all eighty-three DMMUs (Phase I + Phase II DMMUs totaled 91 due to addition of three additional DMMUs and two subsurface DMMUs, D4 and D6, reanalyzed as 7 uncomposited DMMUs) because of timing considerations and concerns about exceeding bioassay holding times. The results of the Phase I and II bioassay results are summarized below.

Standard bioassay testing was conducted on all eighty-three Phase I DMMUs within the 56 day biological holding time. Ten DMMUs sampled during Phase II (e.g., 3 new DMMUs and 7 retested subsurface DMMUs) were subject to concurrent bioassay testing with the standard bioassay testing suite (amphipod, bivalve larval, and *Neanthes* growth bioassays). The three surface DMMUs from the Turning basin/Inner Channel (S101, S102, S103) used *Ampelisca abdita* in lieu of *Eohaustorius estuarius* due to high clay contents (27 – 36.4%). The seven retested Pier subarea subsurface DMMUs were tested using both amphipod species. The DMMP agencies specified retesting with *Eohaustorius estuarius*, and the Navy also elected to run *Ampelisca abdita*, when sediment conventional results indicated that two of the seven uncomposited DMMUs had clay contents greater than 15 percent. Sixty-two DMMUs were subject to amphipod bioassay retesting with *Ampelisca abdita*, whereas a subset of 10 DMMUs were also retested with *Eohaustorius estuarius* bioassay to reconfirm the clay sensitivity relationship noted during Phase I testing. **Appendix B** summarizes the solid phase bioassay Quality Control (QC) performance guidelines as well as the solid phase bioassay interpretative guidelines for nondispersive sites, which were used to evaluate the bioassay data discussed below. **Appendix C** (pages C8-C14) summarizes the Phase I/Phase II bioassay toxicity testing outcomes for the tested DMMUs. Three reference samples were collected from Carr Inlet to block for grain size effects. In general, all negative control and reference sediments met the DMMP performance limits for each of the four bioassay tests (e.g., 2 amphipod species, bivalve larval, and *Neanthes*) to assess toxicity. Summary results (Phase 1 + Phase II) for each bioassay test are depicted in Table 1 for each of the three subareas characterized relative to the DMMP nondispersive interpretative guidelines. These bioassay results are discussed below for each of the bioassay tests.

As noted in **Table A-3**, the amphipod bioassay results tested during Phase I with *Eohaustorius estuarius* showed significant toxicity being expressed among the 83 DMMU. This was later reconfirmed during Phase II retesting testing with a 10 sample subset of the retested DMMUs. An examination of potential

nontreatment effects suggested that clay content may have been a contributing factor to the observed toxicity during Phase I, and this hypothesis was reconfirmed during Phase II testing for a small subset of samples retested with *Eohaustorius*. The possibility of high clay contents affecting *Eohaustorius* survival was sufficient for the DMMP agencies to authorize a retest of 62 DMMUs, in which clay contents exceeded 15 percent (See **Appendix C**, pages C8-C14). Subsequently, both the Phase I and II results for *Eohaustorius* were used for decision-making in the suitability determination, when the clay contents in tested sediment were less than 15 percent. Fifteen percent clay represents the upper end in the range of the reference sediments tested (11.7 –12.3 %), where relatively low toxicity was observed. Correspondingly, results for *Eohaustorius* were not used for decision-making when the clay contents were greater than 15%. Other factors, such as test animal acclimation (salinity, temperature, etc,) were evaluated during the Phase II retest and found not to be a significant factor contributing to the observed toxicity.

The DMMP agencies also evaluated alternative hypotheses for the toxicity by conducting chemical testing utilizing Atomic Emission Detector (AED) screening analyses on six surface and two subsurface samples from the Piers D, B, and 3 subareas. These analyses identified and quantified two potentially toxic components, total phosphate compounds and tricresyl phosphate. These analyses also documented the presence of a petroleum product that is lighter than motor oil and heavier than diesel fuel. These data suggest that other potentially toxic substances in the pier subarea sediments may also have contributed to the toxicity observed during Phase I testing.

As noted in **Table A-3** and **Appendix C** (pages C8-C14), the amphipod bioassay retesting of 62 DMMUs, and 7 uncomposited subsurface DMMUs (D4 and D6), and of 3 new DMMUs from the Turning Basin/Inner Channel with *Ampelisca abdita,* showed no toxity with all 72 DMMUs tested passing the nondispersive site disposal guidelines.

The results of the larval bivalve test (**Appendix C** and **Table A-3**) also showed significant toxicity being expressed although not to the extent shown in the amphipod bioassay. A total of 58 Phase I DMMUs had two-hit and 4 exhibited one-hit toxicity responses, with 21 DMMUs exhibiting no-hit responses according to the nondispersive interpretive disposal guidelines. The results of the Phase II testing, where 10 DMMUs were subject to bivalve larval bioassay testing, appeared to mimic the Phase I results, with 7 two-hit responses and 3 no-hit responses. An examination of potential clay effects on the larval bivalve toxicity after removing the Pier data did show a significant but weak correlation ($r = 0.46$, $p < 0.001$, $n = 62$) for the Turning Basin/Inner Channel, where fewer chemical guideline exceedances were noted. No retesting of the Sediment Larval bioassay was authorized by the DMMP agencies and the Phase I and II results were used in the DMMP non-dispersive site regulatory decision.

Overall interpretation of the bioassay responses combining the Phase I and II responses (See **Appendix C** and **Table A-3**) indicates that virtually all the material from the Turning Basin/Inner Channel passed the unconfined-open-water disposal guidelines (52 of 53 passing), whereas 18 out of 26 Pier surface DMMUs and 9 of 12 subsurface DMMUs passed the DMMP guidelines. Five of the Pier Surface DMMUs (S51, S25, S55, S61, S70) passed the bioassay testing guidelines, and were subject to required bioaccumulation testing because of bioaccumulation trigger exceedances. These DMMUs are discussed below.

Table A-3. Phase I and II (parenthesis) Bioassay interpretation summary for each PSNS subarea.

Amphipod Bioassay: (*Eohaustorius estuarius*)	**Two-Hit Phase I (Phase II)**	**One-Hit Phase I (Phase II)**	**No-Hit Phase I (Phase II)**	**Total: Phase I (Phase II)**
Turning Basin (surface) Clay < 15 %: (see footnote 2 below)[2]	11 (1) **0**	39 (4) **0**	0 (0) **0**	50 (5) **0**
Piers D, B, 3 (surface) Clay < 15 %:	5 (2) **4**	17 (0) **5**	4 (2) **4**	26 (4) **13**
Piers D, B, 3 (subsurface) Clay < 15 %:	2 (1) **1**	4 (1) **1**	1 (6) **6**	7 (8) **8**
Subtotal: Clay < 15%:	18 (4) **5**	60 (5) **6**	5 (8) **10**	83 (17) **21**
Amphipod Bioassay: (*Ampelisca abdita*)	**Two-Hit Phase II only**	**One-Hit Phase II only**	**No-Hit Phase II only**	**Total: Phase II only**
Turning Basin (surface)	0	0	49	49
Piers D, B, 3 (surface)	0	0	15	15
Piers D, B, 3 (subsurface)	0	0	8	8
Subtotal:	**0**	**0**	**72**	**72**
Bivalve Larval Bioassay: (*Mytilus galloprovincialis*)	**Two-Hit Phase I (Phase II)**	**One-Hit Phase I (Phase II)**	**No-Hit Phase I (Phase II)**	**Total: Phase I (Phase II)**
Turning Basin (surface)	33 (3)	0 (0)	17 (0)	50 (3)
Piers D, B, 3 (surface)	19 (0)	3 (0)	4 (0)	26 (0)
Piers D, B, 3 (subsurface)	6 (4)	1 (0)	0 (3)	7 (7)
Subtotal:	**58 (7)**	**4 (0)**	**21 (3)**	**83 (10)**
Neanthes Bioassay: (*Neanthes arenaceodentata*)	**Two-Hit Phase I (Phase II)**	**One-Hit Phase I (Phase II)**	**No-Hit Phase I (Phase II)**	**Total: Phase I (Phase II)**
Turning Basin (surface)	2 (0)	0 (0)	48 (3)	50 (3)
Piers D, B, 3 (surface)	2 (0)	0 (0)	24 (0)	26 (0)
Piers D, B, 3 (subsurface)	1 (0)	0 (0)	6 (7)	7 (7)
Subtotal:	**5 (0)**	**0 (0)**	**78 (10)**	**83 (10)**
DMMP Bioassay Determination: (Phase I + Phase II)	**Number of Suitable DMMUs**		**Number of Unsuitable DMMUs**	
Turning Basin (surface)	52		1	
Piers D, B, 3 (surface)	18		8	
Piers D, B, 3 (subsurface)	9		3	
Subtotal:	**79**		**12**	

[2] Bolded value denotes the number of DMMUs observed during Phase I testing with clay contents < 15 %, for which *Eohaustorius* bioassay results were used to make a final suitability determination. The remaining *Eohaustorius* results with clay contents > 15 % were not used in the final suitability determination.

As noted previously, a number of DMMUs passing bioassay interpretive guidelines, also exceeded bioaccumulation triggers. These are highlighted in **Table A-4** below. Additionally, two DMMUs (S77, S78) with mercury BT/ML exceedances do not need to be considered further because they are unsuitable based on bioassay testing results. Another DMMU (S72) had a Fluoranthene BT exceedance, but also failed bioassy testing guidelines, and no further testing is necessary. The DMMP agencies deliberated on S51, which passed Phase I bioassays, but also exceeded the ML rule, and decided that standard bioaccumulation testing with a 45-day exposure would provide sufficient data in a Tier IV evaluation to enable a DMMP suitability determination to be completed. The Navy elected to proceed with bioaccumulation testing on S51, and the results of the testing of this DMMU is described below. The Navy decided not to archive bioaccumulation samples for S25, S55, S61, S70 during the Phase II resampling effort. After reviewing the Phase II bioassay retesting results, S25, S55, S61, and S70 passed the bioassay interpretative guidelines (see **Appendix C**), but the Navy decided not to pursue bioaccumulation testing of these four DMMUs because of schedule and timing considerations. Therefore, these four DMMUs are considered unsuitable for unconfined-open-water disposal based on DMMP BPJ.

Table A-4. DMMUs passing bioassays with sediment bioaccumulation trigger exceedances.

Chemical	S51	S25	S55	S61	S70
Mercury (BT = 1.5 ppm)	1.75				
Silver (BT = 6.1 ppm)	6.5				
TBT (BT = 0.15 ppb-porewater)		0.15		0.17	
DDT (BT =50 ppb)	748		96.9		
Pentachlorophenol (BT = 504 ppm)	620				
Bis(2-ethylhexyl)phthalate (BT =13,870 ppb)					31,000

As noted in paragraph above only one of the eight DMMUs with bioaccumulation trigger exceedances (S51) was subjected to bioaccumulation testing. The remaining seven DMMUs either failed Tier III bioassay testing (S72, S77, S78), or failed to conduct bioaccumulation testing as required for unconfined open-water disposal (UCOWD) consideration (S25, S55, S61, S70). Therefore, these

seven DMMUs are unsuitable for UCOWD. The sediment analytical results of the resampled DMMU S51 are depicted in **Table A-5**.

Table A-5. Comparative Initial/Resampled Chemical Sediment Concentrations evaluated during 45 day Bioaccumualtion Test of DMMU S51

CHEMICAL NAME	Units	Sediment Initial	Sediment Resample/Retest	Initial/Retest ratio:
Mercury (Hg)	mg/kg-dw	1.75	2.95	0.59
Silver (Ag)	mg/kg-dw	6.5	4	1.63
Pentachlorophenol (PCP)	ug/kg-dw	620	510	1.22
Total DDT	ug/kg-dw	748	15	49.9

The bioaccumulation testing was performed with *Macoma nasuta*, a facultative deposit feeding/suspension feeding bivalve and *Nephtys caecoides*, a burrowing facultative deposit feeding/carnivorous polychaete. The two species were tested together in the same 10-gallon aquaria. However, to provide a better approximation of steady-state tissue concentrations for the tested chemicals (mercury. silver, DDT, pentachlorophenol), the applicant agreed to extend the exposure period from 28 to 45 days based on the recommendation of the DMMP agencies.

Five replicate 10-gallon aquaria were run for the negative control, reference sediment, and for the tested DMMU S51.

Tissue concentrations of chemicals-of-concern measured during the 45-day exposures were compared statistically to the appropriate reference sediment, based on grain size similarity comparisons. The calculated ratios of Phase 1 (initial)/Phase II (retest) sediment chemistry were used to adjust the observed tissue concentrations. When sediment chemistry results from Phase I testing exceed those from Phase II, the ratio of the two are used to adjust the bioaccumulation tissue concentrations to reflect a "worst case" analytical result (Phase I / Phase II > 1). When the ratio is less than 1 (Phase 1 / Phase II < 1), no adjustments are made to the tissue concentration. Statistical comparisons of the test tissue (DMMU S51) and reference tissue concentrations for the final interpretation "worst case" analyses were based on the adjusted tissue concentrations. The summary tissue chemistry interpretation for each of the measured chemicals is provided in **Table A-6** for the four chemicals tested in DMMU S51.

The DMMP agencies agreed that comparing statistical differences from reference is a necessary, but not sufficient condition to determine a DMMU unsuitable for open-water disposal. For each chemical measured within

DMMU-S51 that were statistically greater than reference, a more in depth evaluation is required to determine the significance of the bioaccumulation that had occurred. This evaluation focused on **a)** Food and Drug Administration (FDA) Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food; **b)** PSDDA target tissue concentration values for chemicals of concern to human health, and **c)** ecological residue-effects data from the literature.

a) The FDA guidelines for the chemicals of concern addressed by the bioaccumulation testing are as follows:

mercury (methyl mercury):	1.0 ppm wet weight (ww)
silver:	no guideline
DDT + DDE:	5.0 ppm wet weight (ww)
Pentachlorophenol:	no guideline

b) A risk-based approach was adopted by the PSDDA program in 1988 to set target tissue levels (TTL) for human health. The TTL calculated for **silver** based on risk to humans consuming seafood is **200 ppm wet weight,** and is **900 ppm wet weight** for **Pentachlorophenol.** As part of a suitability determination for the Port of Seattle T-18 dredging project (March 17, 1997 SDM), the DMMP agencies re-evaluated the human health-based Target Tissue Levels (TTLs) for PCBs, total DDT, mercury, and TBT. In recalculating these TTLs, the PSDDA agencies used updated cancer slope factors and reference doses, as well as estimates of fish home range. The TTL developed for **mercury is 450 ppm wet weight**, and for **total DDT is 44 ppm wet weight.**

c) The DMMP agencies conducted a literature review of ecological effects, relative to tissue concentrations (1997 Port of Seattle T-18 (East Waterwau Stage I) Suitability Determination). The agencies reviewed the literature data in the context of DMMP site management objectives:

> "The biological testing guidelines for Site Condition II, which allow for minor significant effects in the laboratory tests, suggest that some biological effects may be expected at the disposal site. The severity and extent of biological effects are not expected to be great because the majority of the species found at the preferred disposal sites are not known to be acutely sensitive to chemicals of concern. Effects associated with Site Condition II will include sublethal effects and, potentially, an increase in the mortality of the more sensitive but less abundant crustacean species. Cumulative effects are expected to consist of a reduction in population and community biomass and an increase in the tissue concentration levels of chemicals of concern."

Table A-6. Bioaccumulation Testing Summary for DMMU S51.

CHEMICAL NAME	Units	TTL Guideline	DMMU S51									
			Macoma nasuta					*Nephtys caecoides*				
			DMMU tissue (Initial)	DMMU tissue (adjusted)	Carr Inlet Reference	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Carr Inlet Reference	Statistically different from reference	statistically below guideline
Mercury (Hg)	mg/kg-ww	1	0.51	0.51	0.12	yes	yes	0.015	0.015	0.038	no	yes
Silver (Ag)	mg/kg-ww	200	0.58	0.95	0.21	yes	yes	0.055	0.089	0.055	no	yes
Pentachlorophenol (PCP)	ug/kg-ww	900	57.0	69.3	51.6	no	yes	41.3	50.2	40.1	no	yes
Total DDT	ug/kg-ww	3,000	48.7	2,429	4.0	yes	yes	58.7	2,927	0.54	yes	yes

d) It was clear from the literature review, that for mercury, human health concerns occurred at lower tissue concentrations than ecological effects. Thus, the DMMP agencie used the FDA guideline (**1.0 ppm ww**) as the mercury TTL. Conversely, for DDT, ecological effects are expected to occur at a lower concentration than human health effects. A literature review conducted as part of the T-18 dredging project identified a concentration range of 3-5 ppm ww in gonads or liver for croakers and cutthroat trout associated with induction of sterility and other reproductive effects[3]. Therefore, the DMMP agencies selected **3.0 ppm ww** for the total DDT TTL to comply with Site Condition II.

e) To summarize, the DMMP agencies used the following TTLs to interpret the bioaccumulation test data for DMMU-S51:

Mercury (methyl mercury):	1.0 ppm ww
Silver:	200 ppm ww
DDT + DDE:	3.0 ppm ww
Pentachlorophenol:	900 ppm ww

The agencies used best professional judgement in developing these interpretation guidelines to meet DMMP disposal site management objectives. These guidelines are subject to change for future DMMP projects as additional bioaccumulation guidance become available.

Each DMMU was compared to these interpretation guidelines using a one-tailed one-sample t-test. An alpha level (the probability of making a Type I error, rejecting the null hypothesis of no difference between test and reference responses when, in fact, they are not different) of 0.1 was selected for these statistical comparisons by the DMMP agencies to reflect the higher within sample variability, and to increase the power of the test to discriminate between reference and test responses. All four chemicals measured in S51 *Macoma* and *Nephtys* tissue were judged to be statistically below the chemical guideline using the adjusted values.

However, the results of the sediment reanalysis of S51 indicated that there was a large disparity between the Phase 1 and Phase 2 analytical results for the COCs that exceeded the BTs, especially for DDT, which was measured at 2 percent of the Phase I result (**Table A-5**). The sediment analysis results

[3] Allison, D.B., B.J. Kallman, O.B. Cope, and C.C. Van Valin. 1964. Some chronic effects of DDT on cutthroat trout. Washington, DC.: U.S. Fish and Wildlife Service, Bureau of Sport Fish. 30 pp.

Childress, R., Texas Parks and Wildlife Department, Levels of concentration and incidence of various pesticide residues in Texas. (unpublished report, 1971).

indicated that silver, PCP and DDT all had ratios greater than 1, and the tissue concentrations were adjusted accordingly (**Table A-6**), whereas mercury was less than 1 and no adjustment was made. Because of the 50-fold discrepancy in the total DDT sediment concentration between the retested (15 ppb) and the initial sediment (748 ppb), the DMMP agencies had serious concerns about the validity of the DDT concentrations measured in the tissues of *Macoma* and *Nephtys*. The agencies were concerned that the DDT bioaccumulation observed in the retested sediments was not a realistic evaluation of bioavailable DDT associated with this DMMU. The discrepancy in sediment DDT was only brought to the attention of the DMMP agencies after the bioaccumulation test had been completed. The DMMP agencies deliberated and concurred that the data for DDT was insufficient for regulatory decision-making and that the test would have to be repeated using a higher DDT exposure concentration closer to the Initial Phase I concentration to be valid for decision-making. The Navy when informed of this decided not to resample and retest S51. Therefore, DMMU-S51 was considered unsuitable for UCOWD using BPJ.

USACE Duwamish Maintenance Dredging. The Corps routinely dredges only the turning basin and upper portion of the Duwamish River Navigation Channel, where low-ranked sediment deposits from the upper reaches of the river. The 2000 characterization was for the lower part of the navigation channel, where sedimentation rates are much lower but contamination issues are greater. All material sampled and tested as part of this characterization was high ranked, and though contamination was found and a portion of the proposed dredged material found unsuitable for open water disposal, for the most part the testing was routine.

The issue of note for this characterization was that a mapping error caused some samples to be taken outside the dredging prism. The error did not occur at the time of sampling, but at the time of Sampling and Analysis Plan (SAP) preparation. With no recent bathymetry maps available, the contractor used cross sections generated from the latest Corps survey to propose sampling locations. Unfortunately, those cross sections were interpreted "backwards," as if one were looking downstream, rather than upstream. In places were shoaling was evident on only one side of the navigation channel, this error resulted in a SAP with samples placed on the opposite side of the channel from the actual shoaling.

The SAP was approved by the DMMP agencies, sampling and analysis took place, and a suitability determination (3 February 2000) was signed. It was only when actual planning for the dredging took place that the error was discovered. The problem affects nine out of 20 DMMU: S1, S12, S13, S14, S15, S16, S17, S18, B2. From these DMMU, actual sampling was from areas with very little dredged material. Of this group, DMMU S1, S15 and B2 failed PSDDA guidelines for open-water disposal and the rest were considered suitable.

Though this sampling event may have accurately characterized the proposed dredging prism, there is no way whether to know whether this is the case. Therefore, with insufficient information for decision-making, DMMUs S12, S13, S14, S16, S17 and S18 cannot be considered suitable for open-water disposal.

Dredging Year 2001

Weyerhaeuser Company/Hylebos Wood Debris Group. The Weyerhaeuser Company dredging project was located at the head of Hylebos Waterway, Commencement Bay in a MTCA cleanup area. The following biological testing summary covers the use of best professional judgement exercised by the DMMP agencies during sediment testing for this project.

Standard bioassay testing was conducted on all nine DMMUs within the 56 day biological holding time. **Appendix B** summarizes the solid phase bioassay Quality Control (QC) performance guidelines and also summarizes the solid phase bioassay interpretative guidelines for nondispersive sites, which were used to evaluate the bioassay data discussed below. Reference sediment was collected from Carr Inlet to conduct DMMU specific test sediment comparisons for the three bioassay tests used during the three testing rounds. Amphipod bioassays conducted during Round 1 testing with *Ampelisca abdita* failed to meet the negative control performance standard, but the single DMMU tested with *Rhepoxynius abronius* met both the negative control and reference performance standards. Amphipod testing during round 2 was problematic, based on performance standard failures for both reference and negative control sediments for both amphipod species (*Rhepoxynius abronius* and *Ampelisca abdita*), which resulted in a requirement to retest a subset of the DMMUs tested. Round 3 amphipod resampling/retesting of 8 of 9 Round 1 DMMUs was conducted with *Ampelisca abdita,* and all Round 3 batches met both the negative control and reference sediment performance standards. Round 2 testing of Weyerhauser sediments was accomplished with the echinoderm (*Dendraster excentricus*), and the sediment larval bioassay meet both the negative control performance and reference performance standards. In general, the *Neanthes* growth bioassay met the DMMP performance standards for the negative control and reference sediments during Rounds 1 and 2 and the results will not be discussed further. Summary bioassay results for each DMMU are depicted in **Appendix C** relative to the DMMP nondispersive interpretative guidelines. Bioassay results are discussed below for the amphipod and sediment larval bioassays only.

a) **Amphipod Bioassay (*Ampelisca abdita, Rhepoxynius abronius*).** The cumulative results for amphipod bioassay testing conducted over three testing rounds are summarized in **Table A-7**. The testing resulted in 5 DMMUs among the three testing rounds exhibiting no-hit responses, 1 DMMU with 2-hit responses, and 3 DMMUs with a 1-hit response. DMMU B-3 had 1-hit responses from both the *Rhepoxynius abronius* and *Ampelisca abdita* bioassays during Round 1 and Round 1 retest.

b) **Bivalve Larval Bioassay (*Dendraster excentricus, Mytilus galloprovincialis*).** Of the Eight of nine DMMU's[4] tested, three passed the DMMP nondispersive guidelines for unconfined open-water disposal, and five exhibited a 2-hit responses (**Table A-7**). One of the three suitable DMMUs exceeded the 2-hit response guidelines, but when statistically compared to the appropriate reference sediment responses, was found to be "not statistically different" ($p<0.1$), and thus is not scored as a "hit" for regulatory decision-making (e.g., "suitable").

c) **DMMP Bioassay Determination.** Overall interpretation of the nine DMMU's tested by the DMMP bioassays demonstrated that five DMMUs exhibited bioassay responses that were suitable for unconfined open-water disposal (UOWD) and four exhibited responses that were unsuitable for UCOWD (**Appendix C**, **Table A-7**).

d) **Bioaccumulation Trigger Exceedances**. Of the six DMMUs that had BT exceedances for TBT, three passed the DMMP bioassays interpretation guidelines for open-water-unconfined disposal during bioassay testing Rounds 1-3. Therefore, three DMMUs (B-5, B-6, B-7) were subject to bioaccumulation testing during Round 4.

Table A-7. Bioassay interpretation summary[3]

Amphipod bioassay: (*Rhepoxynius abronius* & *Ampelisca abdita*)	**Pass**	**Two-Hit**	**One-Hit**	**Total:**
Weyerhaeuser Dock DMMUs	5	1	3	9
Sediment Larval Bioassay: (*Dendraster excentricus)*	**Pass**	**Two-Hit**	**One-Hit**	**Total:**
Weyerhaeuser Dock DMMUs	3	5	0	8
Neanthes Growth Bioassay: (*Neanthes arenaceodentata*)	**Pass**	**Two-Hit**	**One-Hit**	**Total:**
Weyerhaeuser Dock DMMUs	9	0	0	9
DMMP Bioassay Determination:	Number of Suitable DMMUs		Number of Unsuitable DMMUs	
Weyerhaeuser Dock DMMUs	5		4	

The sediment analytical chemical results for the 3 DMMUs that underwent bioaccumulation testing for TBT are presented in **Table A-8**. The results of these sediment analyses indicated that there was often a large

[4] The larval bioassay test was not rerun on DMMU B-3 (see **Appendix C**) in Round 2 because this DMMU exhibited Round-1 single-hit responses for both *Rhepoxynius abronius* and *Ampelisca abdita*.

disparity between the initial and resampled/retested analytical results for porewater-TBT. When the initial result exceeded the retested result, the ratio of the two was used to adjust the bioaccumulation tissue concentrations to reflect a "worst case" analytical result.

Table A-8. Ratio of Initial Sediment Porewater-TBT Concentrations to Retested Sediments for Bioaccumulation Testing

DMMU ID	Initial (ug/L)	Retest (ug/L)	Initial/Retest Ratio
B-5	0.67	0.23	2.91
B-6	0.33	0.16	2.06
B-7	0.17	0.073	2.33

Bioaccumulation testing was performed with *Macoma nasuta*, a facultative deposit feeding/suspension feeding bivalve and *Nephtys caecoides*, a burrowing facultative deposit feeding/carnivorous polychaete. The two species were tested together in the same 8-gallon aquaria. The protocol used followed the recent DMMP protocol clarification (Kendall, 2000), which extended the standard bioaccumulation test duration from 28 days to 45 days. Five replicate 8-gallon aquaria were run for the negative control/reference sediments, and for each of the three tested DMMUs.

Tissue concentrations of chemicals-of-concern from the 45-day exposures were compared statistically to the appropriate reference sediment, based on grain size similarity comparisons. As noted above, the calculated ratios of Phase 1 (initial)/Phase II (retest) sediment chemistry were used to adjust the observed tissue concentrations (**Table A-8**). Statistical comparisons of test DMMUs and reference tissue concentrations for the final interpretation "worst case" analyses were based on the adjusted tissue concentrations. The summary tissue chemistry interpretation for each of the measured chemicals is provided in **Table A-9** for each of the 3 DMMUs tested.

The DMMP agencies agreed that comparing statistical differences from reference is a necessary, but not sufficient condition to determine a DMMU unsuitable for open-water disposal. For those DMMUs that were statistically greater than reference, a more in depth evaluation was required to determine the significance of the bioaccumulation that had occurred. This evaluation focused on **a)** Food and Drug Administration (FDA) Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food; **b)** PSDDA target tissue concentration values for chemicals of concern to human health, and **c)** ecological residue-effects data from the literature.

There are no FDA guidelines for Tributyltin (TBT).

A target tissue trigger level (TTL), of 3 ppm dry weight of TBT in tissue (0.6

ppm wet weight) was used to evaluate the Weyerhaeuser Dock tissue concentrations. This tissue concentration is protective for growth and reproduction endpoints in polychaetes, crustaceans, bivalves, and most gastropods. However, it might not protect the most sensitive species of meso- and neogastropods against imposex-related sterility. Considering that meso- and neogastropods are rare in Elliott Bay (Appendix D in EVS, 1999) and are thus presumed to be rare in Commencement Bay as well, the DMMP agencies have decided to extrapolate the use of the **TBT trigger level (3 ppm dry weight)** derived for the West Waterway on an interim basis to interpret bioaccumulation data relative to disposal at the Commencement Bay disposal site.

To summarize, the DMMP agencies used the following TTLs to interpret the bioaccumulation test data for the proposed Weyerhaeuser Dock dredging area:

TBT: 3.0 ppm dry weight (dw) as TBT

The agencies used best professional judgement in developing the interpretation guidelines to meet PSDDA disposal site management objectives; achievement of other sediment management objectives will require additional evaluation. The use of this guideline is subject to change for future PSDDA/DMMP projects as additional bioaccumulation data become available.

Each of the three DMMU's was compared to these interpretation guidelines using a one-tailed one-sample t-test (see **Table A-9**). An alpha level (the probability of making a Type I error, rejecting the null hypothesis of no difference between test and reference responses when, in fact, they are not different) of 0.1 was selected for these statistical comparisons by the DMMP agencies to reflect the higher within sample variability, and to increase the power of the test to discriminate between reference and test responses. All three DMMU's were found to be statistically less than the TBT target tissue level (TTL) and thus passed the bioaccumulation test.

Table A-9. Bioaccumulation Testing Summary for Weyerhaeuser DMMUs tested under DMMP.

			DMMU B-5									
			Macoma nasuta					*Nephtys caecoides*				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	125	363	4.4	yes	yes	28.1	81.9	0.9	yes	yes
			DMMU B-6									
			Macoma nasuta					*Nephtys caecoides*				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	176	364	4.4	yes	yes	37.6	78	0.9	yes	yes
			DMMU B-7									
			Macoma nasuta					*Nephtys caecoides*				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference	Statistically different from reference	Statstically below guideline
TBT ion (as TBT)	ug/kg-dw	3,000	107	250	4.4	yes	yes	25.2	59	0.9	yes	yes

Port of Anacortes, Cap Sante Marina. Nine of twelve DMMUs tested for the Cap Sante Marina project had screening level exceedances of tributyltin. Additional sediment was collected for bioaccumulation testing based on an addendum to the original sampling plan. Two test composites were created, one representing those samples with TBT detections above 0.30 uG/L and those with detections below 0.30 uG/L but above the SL. TBT exceedances are as follows:

	C1	C2	C6	C7	C8	C9	C10	C11	C12	Comp1	Comp2
TBT in ug/L	0.47	0.20	0.18	0.34	0.29	0.24	0.32	0.27	0.20	0.30	0.29

Bioaccumulation testing was performed with bivalve *Macoma nasuta* and the polychaete *Nephtys caecoides*. The two species were tested together in the same 18-liter glass aquarium. At the time of project initiation, the standard DMMP bioaccumulation protocol called for 28-day test duration. The project proponents agreed to extend the test to 45 days, based on the recommendation of the DMMP agencies. The extended test provides a better approximation of steady-state tissue concentrations for TBT.

Six replicate aquaria (five test replicates and one replicate for steady state monitoring) were run for the two test sediments, the two reference sediments and the negative control. Tissue concentrations from the 45-day exposure were compared to the reference sediments. Initial sediment chemistry was used to adjust the observed tissue concentrations.

The DMMP agencies agreed to use the target tissue level developed for the East Waterway project, 3 ppm dry weight of TBT in tissue, as the value appropriate for the Cap Sante project. Given the limited residue-effects data for the Anacortes area, it was determined that the number calculated for Elliott Bay would be the closest approximation available for making a determination of suitability. The method of calculation and the data supporting this value is documented in the suitability determination for the East Waterway project suitability determination (1999), paragraph 18, and in the "Review of Tissue Residue Effects Data for Tributyltin, Mercury and Polychlorinated Biphenyls", prepared by EVS solutions for the Port of Seattle.

TBT concentrations in tissues from *Macoma* and *Nephtys* exposed to test sediments were significantly less than the target tissue level of 3 ppm dry weight TBT in tissue. TBT tissue concentrations were also compared to reference and no significant differences were observed for both DMMU.

USACE Squalicum Waterway, Bellingham. The Squalicum Waterway is a federal navigation channel in Bellingham, Washington. It is of mixed rank, with

the outer portion ranked moderate and the head of the waterway, near historical industrial use, ranked high. Out of 17 DMMU, 13 had no detected or non-detected chemical exceedances of screening levels (**Table A-10**). Three of those DMMU with SL exceedances (C5, C6 and C7) exhibited borderline exceedances of nickel but no other chemicals of concern. The agencies used best professional judgment for waiving bioassays on these three DMMU, as described below. The fourth DMMU that exceeded screening levels was S2, with high levels of lead found. The agencies defined further testing for S2 before it could be found suitable for open-water disposal, also as described below.

Table A-10. Selected Squalicum Waterway chemistry results.[1]

PARAMETER		Chemical Guidelines			C5 (M)	C6 (M)	C7 (M)	S2 (H)
		SL	BT	ML				
Volume (cubic yards)					15,164	11,564	15,659	1,688
METALS (ppm)	**Lead**	450	--	1,200				2,100
	Nickel	140	370	370	140	141	140	
2,4-Dimethylphenol (ppb)		29	--	210				62

[1]Table includes all chemicals of concern (COCs) that exceeded PSDDA SL triggers. No additional COCs exceeded SLs.

1. Nickel Exceedances. Three DMMU (C5, C6 and C7) in the turning basin area of the navigation channel had nickel detected at or close to (140, 141 and 140 ppm, respectively) the SL (140 ppm). Analysis of the data showed that Ni concentrations were localized in the surface portion of the turning basin material, and concentrations decreased with increasing distance from the turning basin. Grain size showed a high negative correlation with Ni concentration (Figure 1). Similar concentrations have been found in the waterway in past sampling. Though SL exceedances usually trigger Tier 3 bioassays before being found suitable for open water disposal, the agencies' suspended this requirement for these DMMU. This "best professional judgement" decision was based on the following lines of evidence:

similar and greater levels of Ni found in the same area before have passed bioassays
there is circumstantial evidence that background levels of Ni in the Bellingham Bay area are high
there are no apparent anthropogenic sources
these DMMU showed no SL exceedances of any other COC

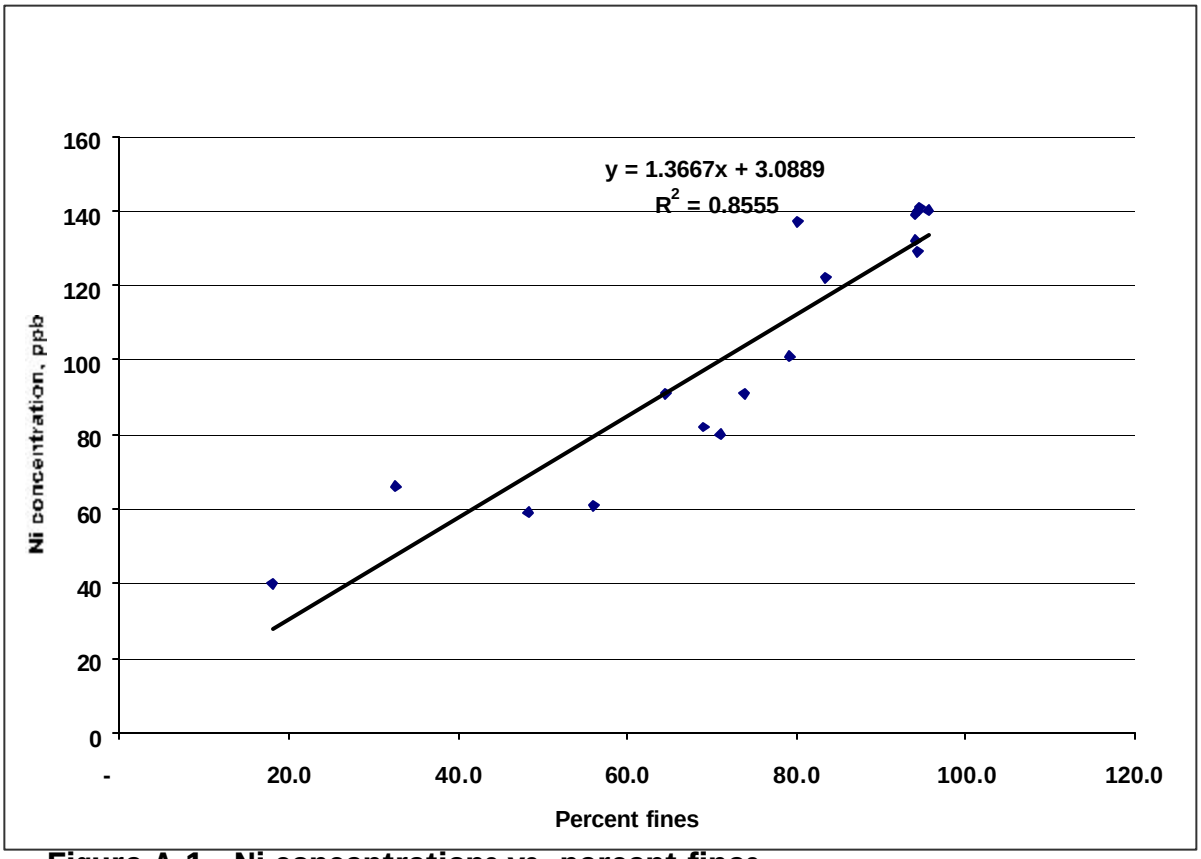

Figure A-1. Ni concentrations vs. percent fines.

2. Lead and 2,4-dimethylphenol Exceedances in S2. Subsurface DMMU S2, in the right berth area, had both an SL exceedance of 2,4-dimethylphenol and an ML exceedance of lead (Table A-10). This level of lead caused much more concern among the agency representatives than did the detections of nickel. To establish an approach for further testing of this DMMU, the agencies looked at the site history, laboratory QA/QC data, and potential human health and environmental effects of lead.

A review of the site history showed that both a plywood company and a boat building business have been located in the area north of the right berthing area since the 1920s. Boat building, of both metal and wooden boats, ceased in the 1960's, though a plywood company continues to operate today. This area was filled to its present shoreline in the 1940s and 50s. At present, the source or extent of subsurface contamination is undetermined.

The analytical laboratory reviewed its procedures and found no indication that the lead measurement was erroneous. There are also potential human as well as environmental effects of lead contamination.

With the above information, the agencies agreed on a plan for further evaluation of S2. The following Tier 3 tests were required before S2 could be considered for open water disposal:

- Acute bioassays with the usual suite of bioassay tests. *Mytilus* should be the species chosen for the larval bioassay due to its sensitivity to metals. Should the sediment fail these tests, it would be unsuitable for open-water disposal.
- 28-day bioaccumulation tests on two species before the sediment could be considered suitable for open-water disposal. Tissue analysis would be for Pb only.
- Should the area be dredged, regardless of disposal area, Z samples would need to be analyzed to make sure that the exposed surface does not exceed Ecology non-degradation standards. Further dredging may be necessary if contamination is shown to go deeper than the proposed dredging prism.
- Bioassay and bioaccumulation tests could be tiered or conducted concurrently.
- Though it was found suitable for open-water disposal, no portion of S1 (overlying S2) should be removed without further testing of subsurface sediments.

Bellingham Cold Storage chose not to pursue further action at this site as part of the current project.

USACE Grays Harbor Maintenance Dredging. Requirements for dredged material characterization in the Grays Harbor Navigation Channel vary in many ways from requirements in other parts of Washington. The channel is dredged annually of over a 1.5 million cubic yards of homogenous, low-ranked material deposited from a large river system into a relatively shallow estuary. The Grays Harbor/Willapa Bay Dredged Material Evaluation Procedures (GHDMEP) outlines a six-year rotation of sampling and testing, with one-third of the channel material tested every two years. The first six year testing cycle was completed in 1999, so the DY 2001 testing began the second cycle. This paragraph describes adaptations to the typical SAP used for this project, and the use of best professional judgment for the choice of sample used for safety-net bioassay testing.

1. Programmatic Sampling Plan. Some "lessons learned" during the first round of testing included:
   - keeping track of areas tested between testing events was difficult and confusing, leading to concerns that some areas or problems could be overlooked
   - material to be dredged is concentrated in the upper reaches of the channel, where the possibility of contamination is greatest, and is not easily divided into thirds for testing

To address these concerns, a Programmatic Sampling and Analysis Plan (PSAP) was prepared to outline the sampling approach for the entire six-year cycle. This PSAP looked at historic dredging volumes in various reaches of the navigation channel and devised a strategy for insuring that the sampling adequately represented those volumes. A SAP addendum was also prepared to address sampling issues specific to the DY 2001 sampling and testing event. If needed, addenda will also be prepared for subsequent sampling events during the six-year testing rotation.

2. Bioassay Sample Selection. Although no detected levels of chemicals of concern exceeded SLs, the detection levels of four COCs exceeded the SLs in one composite (C10). As per guidelines, the analytical laboratory did everything possible to bring down detection limits but was unable to in this sample. According to DMMP guidelines, exceedance of SLs solely by detection limits can trigger biological testing. In Grays Harbor, safety-net bioassay testing on at least two DMMU composites is required by the GHDMEP. Tiered testing due to SL exceedances (detected or non-detected) can be included in the two samples chosen for safety-net bioassays.

For several reasons, C10 was NOT one of the DMMUs chosen for safety-net bioassays. The selection process considers grain size (fine-grained sediments are preferred); sediment chemical results, and the proximity of the collected samples to known or potential contaminant sources. For this characterization, there were three general groups of grain sizes found in the composite samples:

- Fine grained: C1 through C6 all had over 70% fines (representing 58% of all characterized sediments)
- Intermediate grained: C7 and C8, with around 50% fines (representing 19% of all characterized sediments)
- Coarse grained: C9, C10 and C11 ranged from 5% to 27% fines (representing 23% of all characterized sediments)

Most of the sediments in the Cow Point area are very fine-grained, and they represent the bulk of material deposited annually from upstream sources and dredged in a given year. Because the fine-grained DMMUs all showed similar chemical results, C5, with 74% fine-grained material, was randomly chosen to represent this group of sediments. The remainder of the sediments included two intermediate grain-sized and three coarser-grained DMMU. The intermediate- and coarser-grained sediments were all from the area upstream of the Cow Pt. turning basin, in the Aberdeen and South Aberdeen Reaches. The coarser upstream sediments are less frequently dredged and are generally closer than the downstream sediments to known or potential contaminant sources, including the Weyerhaeuser pulp mill in Cosmopolis. It was field observations of the area and sediments sampled in C11 that led to its choice for safety-net biological sampling. In addition to the timber-related activities and paper mill, boat maintenance activities were observed in the area of

DMMU 11. The sediments collected for C11 exhibited a marked oily sheen and odors. Though chemical analysis of the coarse grained sediments showed no detected levels of COCs above the SL, C11 was chosen over C10 for safety-net testing because it was considered a higher risk for potential toxicity based on field observations.

APPENDIX B - DY00/01 GUIDELINE VALUES (CHEMISTRY)

CHEMICAL NAME	Units	SL	BT	ML	(SL+ ML)/2
METALS & ORGANOMETALS					
Antimony	mg/kg	150	150	200	175
Arsenic	mg/kg	57	507.1	700	378.5
Cadmium	mg/kg	5.1		14	9.55
Copper	mg/kg	390		1,300	845
Lead	mg/kg	450		1,200	825
Mercury	mg/kg	0.41	1.5	2.3	1.355
Nickel	mg/kg	140	370	370	255
Silver	mg/kg	6.1	6.1	8.4	7.25
Zinc	mg/kg	410		3,800	2105
TBT ion (porewater)	ug/L	0.15	0.15	--	
LPAH					
Naphthalene	ug/kg	2,100		2,400	2250
Acenaphthene	ug/kg	500		2,000	1250
Acenaphthylene	ug/kg	560		1,300	930
Fluorene	ug/kg	540		3,600	2070
Phenanthrene	ug/kg	1,500		21,000	11250
Anthracene	ug/kg	960		13,000	6980
2-Methylnaphthalene	ug/kg	670		1,900	1285
Total LPAHs	ug/kg	5,200		29,000	17100
HPAH					
Fluoranthene	ug/kg	1,700	4600	30,000	15850
Pyrene	ug/kg	2,600		16,000	9300
Benzo(a)anthracene	ug/kg	1,300		5,100	3200
Benzofluoranthenes (b+k)	ug/kg	3,200		9,900	6550
Chrysene	ug/kg	1,400		21,000	11200
Benzo(a)pyrene	ug/kg	1,600	3600	3,600	2600
Indeno(1,2,3-c,d)pyrene	ug/kg	600		4400	2500
Dibenzo(a,h)anthracene	ug/kg	230		1900	1065
Benzo(g,h,I)perylene	ug/kg	670		3200	1935
Total HPAHs	ug/kg	12,000		69,000	40500
CHLORINATED HYDROCARBONS					
1,2,4-Trichlorobenzene	ug/kg	31		64	47.5
1,2-Dichlorobenzene	ug/kg	35	37	110	72.5
1,3-Dichlorobenzene	ug/kg	170	1,241	--	
1,4-Dichlorobenzene	ug/kg	110	120	120	115
Hexaclorobenzene (HCB)	ug/kg	22	168	230	126
PHTHALATES					0
Bis(2-ethylheyesyl)phthalate	ug/kg	8,300	13,870		4150
Butylbenzylphthalate	ug/kg	970		--	
Di-n-butylphthalate	ug/kg	5,100	10,200	--	
Di-n-octylphthalate	ug/kg	6,200		--	
Diethylphthalate	ug/kg	1,200		--	
Dimethylphthalate	ug/kg	1,400	1,400	--	

APPENDIX B - DY00/01 GUIDELINE VALUES (CHEMISTRY)

CHEMICAL NAME	Units	SL	BT	ML	(SL+ ML)/2
PHENOLS					
2-Methylphenol	ug/kg	63		77	70
4-Methylphenol	ug/kg	670		3,600	2135
2,4-Dimethylphenol	ug/kg	29		210	119.5
Pentachlorophenol	ug/kg	400	504	690	545
Phenol	ug/kg	420	876	1,200	810
MISCELANEOUS EXTRACTABLES					
Benzyl alcohol	ug/kg	57		870	463.5
Benzoic acid	ug/kg	650		760	705
Dibenzofuran	ug/kg	540		1,700	1120
Hexachlorobutadiene	ug/kg	29	212	270	149.5
Hexachloroethane	ug/kg	1,400	10,220	14,000	7700
N-Nitrosodiphenylamine	ug/kg	28	130	130	79
VOLATILE ORGANICS					
Ethylbenzene	ug/kg	10	27	50	30
Tetrachloroethene	ug/kg	57	102	210	133.5
Total Zylene (sum of o,m,p)	ug/kg	40		160	100
Trichloroethane	ug/kg	160	1,168	1,600	880
PESTICIDES AND PCBs					
Total DDT	ug/kg	6.9	50	69	37.95
Aldrin	ug/kg	10	37	--	
alpha-Chlordane	ug/kg	10	37	--	
Dieldrin	ug/kg	10	37	--	
Heptachlor	ug/kg	10	37	--	
gamma-BHC (Lindane)	ug/kg	10	--	--	
Total PCBs	ug/kg	130	38 (1)	3,100	1615

(1) mg/kg - carbon normalized

Appendix B. DY00/01 DMMP BIOASSAY PERFORMANCE STANDARDS AND EVALUATION GUIDELINES

Bioassay	Negative Control Performance Standard	Reference Sediment Performance Standard	Dispersive Disposal Site Interpretation Guidelines		Nondispersive Disposal Site Interpretation Guidelines	
			1-hit rule	2-hit rule	1-hit rule	2-hit rule
Amphipod	$M_C \leq 10\%$	$M_R - M_C \leq 20\%$	$M_T - M_C > 20\%$ and M_T vs M_R SD (p=.05) and		$M_T - M_C > 20\%$ and M_T vs M_R SD (p=.05) and	
			$M_T - M_R > 10\%$	NOCN	$M_T - M_R > 30\%$	NOCN
Larval	$N_C \div I \geq 0.70$	$N_R \geq N_C \geq 0.65$	$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD (p=.10) and		$N_T \div N_C < 0.80$ and N_T/N_C vs N_R/N_C SD (p=.10) and	
			$N_R/N_C - N_T/N_C > 0.15$	NOCN	$N_R/N_C - N_T/N_C > 0.30$	NOCN
Neanthes growth	$M_C \leq 10\%$ and $MIG_C > 0.38$	$M_R \leq 20\%$ and $MIG_R \div MIG_C \geq 0.80$	$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD (p=.05) and		$MIG_T \div MIG_C < 0.80$ and MIG_T vs MIG_R SD (p=.05) and	
			$MIG_T/MIG_R < 0.70$	NOCN	$MIG_T/MIG_R < 0.50$	$MIG_T/MIG_R < 0.70$

M = mortality, N = normal survivors, I = initial count, MIG = mean individual growth rate (mg/individual/day)
SD = statistically different, NOCN = no other conditions necessary, N/A = not applicable
Subscripts: R = reference sediment, C = negative control, T = test sediment

APPENDIX C – LEGEND

S	=	reported concentration exceeds screening level
SB	=	reported concentration exceeds screening level and bioaccumulation trigger
M	=	reported concentration exceeds maximum level
BM	=	reported concentration exceeds bioaccumulation trigger and maximum level
(U)	=	detection limit exceeds either screening level, bioaccumulation trigger, or maximum level
(B)	=	analyte detected in corresponding blank
(E)	=	estimate
(J)	=	detected between the SDL and the CRDL
(UJ)	=	analyte not detected above the sample quanititation limit; however the reported quantitation limit is approximate
(D)	=	compound required a dilution as a result of the matrix or the sample concentration
(M)	=	estimated value of analyte found and confirmed by analyst, but with low spectral match
(N)	=	estimate based on presumptive evidence
(G)	=	estimate is greater than value shown
(Y)	=	raised non-detect due to matrix interferences
NA	=	not analyzed
2H	=	a hit under two-hit interpretation guideline
1H	=	a hit under one-hit interpretation guideline
PASS	=	test sediment passes DMMP guidelines for open-water unconfined disposal
FAIL	=	test sediment fails DMMP guidelines for open-water unconfined disposal
FAIL(C)	=	DMMU found unsuitable for open-water disposal in the absence of bioaccumulation and/or Tier IV testing data
(BPJ)	=	best professional judgement applied to suitability determination
L	=	the highest reported concentration was below SL
LM	=	the highest reported concentration was between SL and (SL + ML)/2
M	=	the highest reported concentration was between (SL + ML)/2 and ML
H	=	the highest reported concentration exceeded ML
H*	=	the sediment rank is based on biological testing results

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)															
DMMU ID:	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury					S		S	S		S	S	S	S	S	S	S
Nickel																
Silver																
Zinc																
TBT ion (porewater)	SB			SB	SB (MB)	SB (MB)	SB (MB)	SB (M)								
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene								S								
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT	S (U)				S (U)	S (U)	S	S	S (UJ)	S (U)	SB (U)	SB (UJ)	S (UJ)	S (UJ)	S (UJ)	SB (UJ)
Aldrin											S (U)	S (U)	S (U)	S (U)		S (UJ)
alpha-Chlordane																
Dieldrin											S (U)	S (U)	S (U)	S (U)		S (U)
Heptachlor												S (U)		S (U)		S (U)
gamma-BHC (Lindane)																
Total PCBs	SB			S	SB	SB	S	S	SB	SB	BM	SB	SB	SB	S	SB
BIOASSAYS																
Amphipod																
Sediment Larval (Bivalve/Echinoderm)	1H	2H	2H		2H	2H	2H	2H		2H	2H	2H			2H	
Neanthes Growth									2H			2H				
Bioassay: (Pass/Fail)	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS	PASS	PASS
BTs eyesceeded:	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes
Bioaccumulation test conducted:	no			yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes		yes
Bioaccumulation (Pass/Fail):				PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL		PASS	PASS		FAIL
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	PASS	PASS	PASS	FAIL
HIGHEST RANKING:	H*	L	L	LM	LM	LM	LM	LM	M	LM	H*	H*	LM	M	LM	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)															
DMMU ID:	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium								S	S							
Copper																
Lead																
Mercury	S						S	S						S		
Nickel																
Silver																
Zinc								S	S							
TBT ion (porewater)	SB (J)				SB (M)		SB (J)	SB (M)	SB (M)	SB (MB)					SB (B)	
LPAH																
Naphthalene																
Acenaphthene								S	S							
Acenaphthylene																
Fluorene								S	S							
Phenanthrene								S	S							
Anthracene																
2-Methylnaphthalene									S							
Total LPAHs									S							
HPAH																
Fluoranthene									S							
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT	SB (UJ)		S (U)	S (U)	S (UJ)		BM (U)	BM (J)	BM (U)	S (UJ)	S (UJ)	S (J)	S (J)	S (J)		
Aldrin	S (UJ)				S (U)		S (U)	S (U)	S (U)							
alpha-Chlordane								S (U)	S (U)							
Dieldrin	S (U)				S (U)		S (U)	S (U)	SB (U)	S (U)						
Heptachlor	S (U)							S (U)	S (U)							
gamma-BHC (Lindane)																
Total PCBs	SB		SB	S	SB		BM	SB	S	S	S	S		S		
BIOASSAYS																
Amphipod	2H															
Sediment Larval (Bivalve/Echinoderm)	2H		2H	2H	2H	2H	2H	1H	2H	2H		2H		2H	2H	2H
Neanthes Growth	2H			2H				1H	1H	2H						
Bioassay: (Pass/Fail)	FAIL	PASS	PASS	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
BTs eyesceeded:	yes	no	yes	no	yes	no	yes	yes	yes	yes	no	no	no	no	yes	no
Bioaccumulation test conducted:	no		yes		yes		yes	no	no	no					yes	
Bioaccumulation (Pass/Fail):			PASS		PASS		FAIL								FAIL	
ML Rule exceeded:	no	no	no	no	no	no	**yes**	**yes**	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL	PASS	PASS	FAIL	PASS	PASS	FAIL	FAIL (c+b)	FAIL	FAIL	PASS	PASS	PASS	PASS	FAIL	PASS
HIGHEST RANKING:	H*	L	LM	H*	LM	L	H*	H*	H*	H*	LM	LM	LM	LM	H*	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)															
DMMU ID:	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium					S											
Copper																
Lead																
Mercury	S		S	S	S							S	S			S
Nickel																
Silver																BM
Zinc					S				S							S
TBT ion (porewater)			SB (MB)	SB (MB)		SB (M)	SB (M)	SB (M)	SB (M)		SB (MB)			SB	SB	SB (M)
LPAH																
Naphthalene					S											
Acenaphthene			S		S											
Acenaphthylene																
Fluorene			S		S											
Phenanthrene			S		S											
Anthracene																
2-Methylnaphthalene					S											S
Total LPAHs					S											
HPAH																
Fluoranthene			S	S	S											S
Pyrene			S													S
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																S(J)
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																S (J)
Dibenzo(a,h)anthracene																S (J)
Benzo(g,h,I)perylene																S (J)
Total HPAHs			S													S (J)
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene				S												
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																S (J)
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol	S															
2,4-Dimethylphenol	S															
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene					S											
Tetrachloroethene																
Total Zylene (sum of o,m,p)					S (M)											
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT			SB (UJ)	BM (UJ)	BM (J)										S (UJ)	S (J)
Aldrin			S (U)	S (U)	S (U)	S (U)										
alpha-Chlordane					S (U)	S (U)										
Dieldrin				SB (U)	S (U)	S (U)										S (U)
Heptachlor			S (U)	S (U)	S (U)	S (U)										S (U)
gamma-BHC (Lindane)																
Total PCBs		S	SB	BM	BM	SB	S		S			S		S	S	SB
BIOASSAYS																
Amphipod													2H			
Sediment Larval (Bivalve/Echinoderm)	2H	1H	2H	1H	1H	1H	2H	2H	2H	2H	2H	2H	2H	2H	2H	1H
Neanthes Growth			2H	1H	1H	1H										2H
Bioassay: (Pass/Fail)	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS	FAIL
BTs eyesceeded:	no	no	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes
Bioaccumulation test conducted:			no	no	no	no	yes	yes	yes		yes			yes	yes	no
Bioaccumulation (Pass/Fail):							PASS	PASS	PASS		PASS			PASS	PASS	
ML Rule exceeded:	no	no	no	**yes**	**yes**	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	FAIL	FAIL	FAIL (c+b)	FAIL (c+b)	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS	FAIL
HIGHEST RANKING:	LM	H*	H*	H*	H*	H*	LM	LM	LM	L	LM	LM	H*	LM	LM	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)																
DMMU ID:	S49	S50	S51	S52	S53	S54	S55	S56	S57	S58	S59	S60	D1	D2	D3	D4
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																	
Antimony																	
Arsenic																	
Cadmium			S														
Copper																	
Lead																	
Mercury	S	S	S														
Nickel																	
Silver																	
Zinc	S	S															
TBT ion (porewater)	SB (MB)	SB (B)		SB (M)					SB (MB)								
LPAH																	
Naphthalene																	
Acenaphthene		S	S														
Acenaphthylene																	
Fluorene		S	S														
Phenanthrene		S	S														
Anthracene		S															
2-Methylnaphthalene		S	S														
Total LPAHs		S	S														
HPAH																	
Fluoranthene		SB	S						S								
Pyrene		S	S						S								
Benzo(a)anthracene		S	S														
Benzofluoranthenes (b+k)																	
Chrysene		S	S														
Benzo(a)pyrene		S															
Indeno(1,2,3-c,d)pyrene		S															
Dibenzo(a,h)anthracene		S (J)															
Benzo(g,h,I)perylene		S (J)															
Total HPAHs		S (J)	S														
CHLORINATED HYDROCARBONS																	
1,2,4-Trichlorobenzene																	
1,2-Dichlorobenzene																	
1,3-Dichlorobenzene																	
1,4-Dichlorobenzene																	
Hexaclorobenzene (HCB)																	
PHTHALATES																	
Bis(2-ethylheyesyl)phthalate																	
Butylbenzylphthalate																	
Di-n-butylphthalate																	
Di-n-octylphthalate																	
Diethylphthalate																	
Dimethylphthalate																	
PHENOLS																	
2-Methylphenol																	
4-Methylphenol																	
2,4-Dimethylphenol																	
Pentachlorophenol																	
Phenol																	
MISCELANEOUS EXTRACTABLES																	
Benzyl alcohol																	
Benzoic acid																	
Dibenzofuran			S														
Hexachlorobutadiene																	
Hexachloroethane																	
N-Nitrosodiphenylamine																	
VOLATILE ORGANICS																	
Ethylbenzene																	
Tetrachloroethene																	
Total Zylene (sum of o,m,p)																	
Trichloroethane																	
PESTICIDES AND PCBs																	
Total DDT	S (UJ)	S (UJ)	BM (J)														
Aldrin		S (U)	S (U)														
alpha-Chlordane			S (U)														
Dieldrin	S (U)		SB (U)			S (U)											
Heptachlor			S (U)														
gamma-BHC (Lindane)																	
Total PCBs	SB	SB	BM	S		S			S	S		S					
BIOASSAYS																	
Amphipod																	
Sediment Larval (Bivalve/Echinoderm)	2H	2H	1H	2H	2H	2H		2H	2H		2H	2H			2H	2H
Neanthes Growth			1H														
Bioassay: (Pass/Fail)	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
BTs eyesceeded:	yes	yes	yes	yes	no	no	no	no	yes	no	no	no	no	no	no	no
Bioaccumulation test conducted:	yes	yes	no	yes					yes							
Bioaccumulation (Pass/Fail):	PASS	PASS		PASS					PASS							
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	FAIL (c+b)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
HIGHEST RANKING:	LM	LM	H*	LM	L	LM	L	L	LM	LM	L	LM	L	L	L	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)														
DMMU ID:	D5	D6	D7	**D7a**	**D7b**	**D7c**	D8	D9	D10	D11	D12	D13	D14	D15	D16
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS															
Antimony															
Arsenic															
Cadmium															
Copper												S			
Lead															
Mercury	S		S	BM	SB	S						S	S		
Nickel															
Silver												SB			
Zinc						S									
TBT ion (porewater)															
LPAH															
Naphthalene															
Acenaphthene															
Acenaphthylene															
Fluorene															
Phenanthrene															
Anthracene															
2-Methylnaphthalene															
Total LPAHs															
HPAH															
Fluoranthene															
Pyrene															
Benzo(a)anthracene															
Benzofluoranthenes (b+k)															
Chrysene															
Benzo(a)pyrene															
Indeno(1,2,3-c,d)pyrene															
Dibenzo(a,h)anthracene															
Benzo(g,h,I)perylene															
Total HPAHs															
CHLORINATED HYDROCARBONS															
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Hexaclorobenzene (HCB)															
PHTHALATES															
Bis(2-ethylheyesyl)phthalate															
Butylbenzylphthalate															
Di-n-butylphthalate															
Di-n-octylphthalate															
Diethylphthalate															
Dimethylphthalate															
PHENOLS															
2-Methylphenol															
4-Methylphenol															
2,4-Dimethylphenol				S (U)	S (U)	S (U)									
Pentachlorophenol															
Phenol															
MISCELANEOUS EXTRACTABLES															
Benzyl alcohol				S (U)	S (U)	S (U)									
Benzoic acid															
Dibenzofuran															
Hexachlorobutadiene															
Hexachloroethane															
N-Nitrosodiphenylamine															
VOLATILE ORGANICS															
Ethylbenzene															
Tetrachloroethene															
Total Zylene (sum of o,m,p)															
Trichloroethane															
PESTICIDES AND PCBs															
Total DDT			BM (UJ)	SB (Y)	SB (Y)	BM (Y)			S (U)			S (UJ)	S (J)		
Aldrin															
alpha-Chlordane			SB (U)												
Dieldrin			SB (U)										S (U)		
Heptachlor															
gamma-BHC (Lindane)															
Total PCBs	S		BM	S	SB	SB		S	S			S	SB		
BIOASSAYS															
Amphipod			2H	1H	1H	1H									
Sediment Larval (Bivalve/Echinoderm)				2H	2H	1H			2H		2H	1H	1H	2H	2H
Neanthes Growth			1H	1H	1H	1H			2H			1H	1H	2H	
Bioassay: (Pass/Fail)	PASS	PASS	FAIL	FAIL	FAIL	FAIL	PASS	PASS	FAIL	PASS	PASS	FAIL	FAIL	FAIL	PASS
BTs eyesceeded:	no	no	yes	yes	yes	yes	no	no	no	no	no	yes	yes	no	no
Bioaccumulation test conducted:			no	no	no	no						no	no		
Bioaccumulation (Pass/Fail):															
ML Rule exceeded:	no	no	**yes**	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	FAIL (c+b)	FAIL	FAIL	FAIL	PASS	PASS	FAIL	PASS	PASS	FAIL	FAIL	FAIL	PASS
HIGHEST RANKING:	LM	L	H*	H*	H*	H*	L	LM	H*	L	L	H*	H*	H*	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)															
DMMU ID:	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30	D31	D32
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury										S						
Nickel																
Silver																
Zinc																
TBT ion (porewater)																
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol					S											
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																S (U)
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs	S	S	S													SB
BIOASSAYS																
Amphipod																
Sediment Larval (Bivalve/Echinoderm)	2H	2H	2H	2H		2H		2H	2H							
Neanthes Growth														2H		1H
Bioassay: (Pass/Fail)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL
BTs eyesceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes
Bioaccumulation test conducted:																no
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL
HIGHEST RANKING:	LM	LM	LM	L	LM	L	L	L	L	LM	L	L	L	L	L	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	Eastwaterway Project (Phase 2)							US Coast Guard Slip 36							
DMMU ID:	D33	D34	D35	D36	D37	D38	D39	CG-S61	CG-S62	CG-S63	CG-S64	CG-S65	CG-S66	CG-S67	CG-D40
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS															
Antimony															
Arsenic															
Cadmium						S									
Copper													S		
Lead													S		
Mercury				S	S	S									
Nickel															
Silver													BM		
Zinc						S							S		
TBT ion (porewater)															
LPAH															
Naphthalene															
Acenaphthene															
Acenaphthylene															
Fluorene															
Phenanthrene															
Anthracene															
2-Methylnaphthalene	S														
Total LPAHs															
HPAH															
Fluoranthene									S						
Pyrene										S	S		S		
Benzo(a)anthracene															
Benzofluoranthenes (b+k)															
Chrysene															
Benzo(a)pyrene															
Indeno(1,2,3-c,d)pyrene															
Dibenzo(a,h)anthracene											S				
Benzo(g,h,I)perylene															
Total HPAHs											S				
CHLORINATED HYDROCARBONS															
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Hexaclorobenzene (HCB)						S (U)									
PHTHALATES															
Bis(2-ethylheyesyl)phthalate															
Butylbenzylphthalate															
Di-n-butylphthalate															
Di-n-octylphthalate															
Diethylphthalate															
Dimethylphthalate															
PHENOLS															
2-Methylphenol						S (U)									
4-Methylphenol															
2,4-Dimethylphenol						S (U)									
Pentachlorophenol						S (U)									
Phenol															
MISCELANEOUS EXTRACTABLES															
Benzyl alcohol						S (U)									
Benzoic acid						S (U)									
Dibenzofuran															
Hexachlorobutadiene						S (U)									
Hexachloroethane															
N-Nitrosodiphenylamine						S (U)									
VOLATILE ORGANICS															
Ethylbenzene															
Tetrachloroethene															
Total Zylene (sum of o,m,p)															
Trichloroethane															
PESTICIDES AND PCBs															
Total DDT	BM (U)			BM (U)	BM (U)	BM (U)			S	S (J)	SB (J)	S	S	S	
Aldrin	S (U)				S (U)	S (U)									
alpha-Chlordane					S (U)	S (U)									
Dieldrin	S (U)			S	S (U)	S (U)									
Heptachlor						S (U)									
gamma-BHC (Lindane)															
Total PCBs	SB			BM	BM	SB	S		S	S	S		S		
BIOASSAYS															
Amphipod						2H									
Sediment Larval (Bivalve/Echinoderm)	1H	2H		1H	1H	1H		2H		1H	1H	1H	1H	2H	
Neanthes Growth	1H	1H	1H	1H	1H	1H	2H								
Bioassay: (Pass/Fail)	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	PASS	PASS
BTs eyesceeded:	yes	no	no	yes	yes	yes	no	no	no	no	no	np	yes	no	no
Bioaccumulation test conducted:	no			no	no	no							no		
Bioaccumulation (Pass/Fail):															
ML Rule exceeded:	no	no	no	**yes**	**yes**	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL	FAIL	FAIL	FAIL (c+b)	FAIL (c+b)	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	PASS	PASS
HIGHEST RANKING:	H*	H*	H*	H*	H*	H*	LM	LM	LM	H*	H*	H*	H*	LM	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT															
DMMU ID:	S1	S1-R	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury		S			S				S	S	S					S
Nickel																
Silver																
Zinc																
TBT ion (porewater)																
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs																
BIOASSAYS																
Amphipod																
Sediment Larval (Bivalve/Echinoderm)	2H		2H	2H	2H	2H	2H	2H	2H	2H	2H	2H	2H			2H
Neanthes Growth																
Bioassay: (Pass/Fail)		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
BTs eyesceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Bioaccumulation test conducted:																
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
HIGHEST RANKING:	L	LM	L	L	LM	L	L	L	LM	LM	LM	L	L	L	L	LM

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT															
DMMU ID:	S16	S17	S18	S19	S20	S21	S22	S22-R	S23	S23-R	S24	S25	S26	S26-R	S27	S28
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury	S							S						S		
Nickel																
Silver																
Zinc																
TBT ion (porewater)												SB				
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)								S (UJ)		S (U)						
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol								S (UD)								
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol								S (UD)		S (U)						
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene								S (UD)		S (U)						
Hexachloroethane																
N-Nitrosodiphenylamine								S (UD)		S (U)						
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs																
BIOASSAYS																
Amphipod											2H					
Sediment Larval (Bivalve/Echinoderm)				2H	2H		2H		2H				2H			
Neanthes Growth			2H													
Bioassay: (Pass/Fail)	PASS	PASS	PASS	PASS	PASS	PASS		PASS		PASS	PASS	PASS		PASS	PASS	PASS
BTs eyesceded:	no	no	no	no	no	no	no	no	no	no	no	**yes**	no	no	no	no
Bioaccumulation test conducted:												no				
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS	PASS	PASS	PASS		PASS		PASS	PASS	FAIL (C)		PASS	PASS	PASS
HIGHEST RANKING:	LM	L	L	L	L	L	L	LM	L	LM	L	H*	L	LM	L	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT															
DMMU ID:	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury																S
Nickel																
Silver																
Zinc																
TBT ion (porewater)																
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs																
BIOASSAYS																
Amphipod	2H															
Sediment Larval (Bivalve/Echinoderm)		2H	2H		2H	2H	2H	2H	2H	2H	2H	2H	2H	2H	2H	
Neanthes Growth								2H								
Bioassay: (Pass/Fail)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
BTs eyesceded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Bioaccumulation test conducted:																
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
HIGHEST RANKING:	L	L	L	L	L	L	L	H*	L	L	L	L	L	L	L	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT															
DMMU ID:	S45	S46	S47	S48	S48-R	S49	S50	S51	S52	S53	S54	S55	S56	S56-R	S57	S58
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead									S							
Mercury	S							SB	S		S	S				
Nickel																
Silver								SB								
Zinc								S								
TBT ion (porewater)																
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene								S								
Pyrene								S								
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene								S (UD)								
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)								S (UD)						S (UD)		
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol								S (UD)								
4-Methylphenol								S (UD)								
2,4-Dimethylphenol								S (UD)								
Pentachlorophenol								SB (UD)								
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol								S (UD)								
Benzoic acid								BM								
Dibenzofuran																
Hexachlorobutadiene								S (UD)						S (UD)		
Hexachloroethane																
N-Nitrosodiphenylamine								S (UD)								
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT								BM				BM				
Aldrin																
alpha-Chlordane								S								
Dieldrin								S								
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs								S		S		S				
BIOASSAYS																
Amphipod							2H								2H	
Sediment Larval (Bivalve/Echinoderm)		2H		2H				2H	1H	2H	2H	2H	2H		2H	
Neanthes Growth																
Bioassay: (Pass/Fail)	PASS	PASS	PASS		PASS	PASS	PASS	PASS	FAIL	PASS	PASS	PASS		PASS	FAIL	PASS
BTs eyesceded:	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no
Bioaccumulation test conducted:								yes								
Bioaccumulation (Pass/Fail):								FAIL								
ML Rule exceeded:	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS		PASS	PASS	PASS	FAIL	FAIL	PASS	PASS	FAIL(C)		PASS	FAIL	PASS
HIGHEST RANKING:	LM	L	L	L	L	L	L	H*	H*	LM	LM	H	L	LM	H*	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT														
DMMU ID:	S59	S60	S61	**S62**	**S62-R**	**S63**	S64	S65	S66	S67	S68	S69	S70	S71	S71-R
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS															
Antimony															
Arsenic															
Cadmium															
Copper															
Lead															
Mercury	S	S	S			S	S		S	S	S	S	S		
Nickel															
Silver															
Zinc															
TBT ion (porewater)			SB (E)												
LPAH															
Naphthalene															
Acenaphthene															
Acenaphthylene															
Fluorene															
Phenanthrene															
Anthracene															
2-Methylnaphthalene															
Total LPAHs															
HPAH															
Fluoranthene															
Pyrene															
Benzo(a)anthracene															
Benzofluoranthenes (b+k)															
Chrysene															
Benzo(a)pyrene															
Indeno(1,2,3-c,d)pyrene															
Dibenzo(a,h)anthracene															
Benzo(g,h,I)perylene															
Total HPAHs															
CHLORINATED HYDROCARBONS															
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Hexaclorobenzene (HCB)												S (UD)			
PHTHALATES															
Bis(2-ethylheyesyl)phthalate													SB (D)		
Butylbenzylphthalate															
Di-n-butylphthalate															
Di-n-octylphthalate															
Diethylphthalate															
Dimethylphthalate															
PHENOLS															
2-Methylphenol															
4-Methylphenol															
2,4-Dimethylphenol															
Pentachlorophenol															
Phenol															
MISCELANEOUS EXTRACTABLES															
Benzyl alcohol															
Benzoic acid															
Dibenzofuran															
Hexachlorobutadiene															
Hexachloroethane															
N-Nitrosodiphenylamine															
VOLATILE ORGANICS															
Ethylbenzene															
Tetrachloroethene															
Total Zylene (sum of o,m,p)															
Trichloroethane															
PESTICIDES AND PCBs															
Total DDT															
Aldrin															
alpha-Chlordane															
Dieldrin															
Heptachlor															
gamma-BHC (Lindane)															
Total PCBs						S	S			S	S		S		
BIOASSAYS															
Amphipod		2H								2H					
Sediment Larval (Bivalve/Echinoderm)	2H	2H		2H		2H	2H	2H	2H	2H	2H	2H		2H	
Neanthes Growth								2H							
Bioassay: (Pass/Fail)	PASS	FAIL	PASS		PASS	PASS	PASS	FAIL	PASS	FAIL	PASS	PASS	PASS	PASS	PASS
BTs eyesceded:	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no
Bioaccumulation test conducted:													no		
Bioaccumulation (Pass/Fail):															
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	FAIL	FAIL(C)		PASS	PASS	PASS	FAIL	PASS	FAIL	PASS	PASS	FAIL(C)		PASS
HIGHEST RANKING:	LM	H*	H	L	L	LM	LM	H*	LM	H*	LM	LM	H	L	L

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT																
DMMU ID:	S72	S73	S73-R	S77	S78	S80	D1	D2	D3	D3-R	D4a	D4b	D4c	D4d	D5	D6a
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																	
Antimony																	
Arsenic				S													
Cadmium																	
Copper				S	S												
Lead																	
Mercury	S			BM	BM		S										
Nickel																	
Silver																	
Zinc					S												
TBT ion (porewater)																	
LPAH																	
Naphthalene																	
Acenaphthene	S																
Acenaphthylene																	
Fluorene	S																
Phenanthrene	S (D)																
Anthracene	S																
2-Methylnaphthalene																	
Total LPAHs																	
HPAH																	
Fluoranthene	SB (D)																
Pyrene	S (D)																
Benzo(a)anthracene	S (D)																
Benzofluoranthenes (b+k)																	
Chrysene	S (D)																
Benzo(a)pyrene																	
Indeno(1,2,3-c,d)pyrene	S																
Dibenzo(a,h)anthracene																	
Benzo(g,h,I)perylene																	
Total HPAHs	S																
CHLORINATED HYDROCARBONS																	
1,2,4-Trichlorobenzene																	
1,2-Dichlorobenzene																	
1,3-Dichlorobenzene																	
1,4-Dichlorobenzene																	
Hexaclorobenzene (HCB)				S (UD)	S (UD)												
PHTHALATES																	
Bis(2-ethylheyesyl)phthalate																	
Butylbenzylphthalate																	
Di-n-butylphthalate																	
Di-n-octylphthalate																	
Diethylphthalate																	
Dimethylphthalate																	
PHENOLS																	
2-Methylphenol																	
4-Methylphenol																	
2,4-Dimethylphenol				S (UD)	S (UD)												
Pentachlorophenol																	
Phenol																	
MISCELANEOUS EXTRACTABLES																	
Benzyl alcohol				S (UD)													
Benzoic acid																	
Dibenzofuran																	
Hexachlorobutadiene				S (UD)	S (UD)												
Hexachloroethane																	
N-Nitrosodiphenylamine				S (UD)	S (UD)												
VOLATILE ORGANICS																	
Ethylbenzene																	
Tetrachloroethene																	
Total Zylene (sum of o,m,p)																	
Trichloroethane																	
PESTICIDES AND PCBs																	
Total DDT																	
Aldrin																	
alpha-Chlordane																	
Dieldrin																	
Heptachlor																	
gamma-BHC (Lindane)																	
Total PCBs	S			S	S												
BIOASSAYS																	
Amphipod	1H			2H	1H		2H								1H		
Sediment Larval (Bivalve/Echinoderm)	2H			1H	1H	2H	1H	2H	2H				2H	2H	2H		
Neanthes Growth				2H											2H		
Bioassay: (Pass/Fail)	FAIL		PASS	FAIL	FAIL	PASS	FAIL	PASS		PASS	PASS	PASS	PASS	PASS	FAIL	PASS	
BTs eyesceded:	yes	no	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no	
Bioaccumulation test conducted:	no			no	no												
Bioaccumulation (Pass/Fail):																	
ML Rule exceeded:	no	no	no	yes	yes	no	no	no	no	no	no	no	no	no	no	no	
OVERALL PASS/FAIL:	FAIL			FAIL	FAIL	PASS	FAIL	PASS		PASS	PASS	PASS	PASS	PASS	FAIL	PASS	
HIGHEST RANKING:	H*	L	L	H*	H*	L	H*	L	L	L	L	L	L	L	H*	L	

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	US NAVY PSNS PROJECT						JAMES HARDIE GYPSUM							OLYMPIA HARB	
DMMU ID:	D6b	D6c	D8	SS101	SS102	SS103	S2B	S3	S5	CB	CC	CD	CE	B1	TBW1
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS															
Antimony															
Arsenic															
Cadmium															
Copper															
Lead															
Mercury												S			
Nickel															
Silver															
Zinc															
TBT ion (porewater)														SB	SB
LPAH															
Naphthalene															
Acenaphthene															
Acenaphthylene															
Fluorene															
Phenanthrene											S				
Anthracene															
2-Methylnaphthalene															
Total LPAHs															
HPAH															
Fluoranthene											S				
Pyrene											S				
Benzo(a)anthracene															
Benzofluoranthenes (b+k)															
Chrysene															
Benzo(a)pyrene															
Indeno(1,2,3-c,d)pyrene															
Dibenzo(a,h)anthracene															
Benzo(g,h,I)perylene															
Total HPAHs															
CHLORINATED HYDROCARBONS															
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Hexaclorobenzene (HCB)															
PHTHALATES															
Bis(2-ethylheyesyl)phthalate															
Butylbenzylphthalate															
Di-n-butylphthalate															
Di-n-octylphthalate															
Diethylphthalate															
Dimethylphthalate															
PHENOLS															
2-Methylphenol															
4-Methylphenol															
2,4-Dimethylphenol															
Pentachlorophenol															
Phenol															
MISCELANEOUS EXTRACTABLES															
Benzyl alcohol															
Benzoic acid															
Dibenzofuran															
Hexachlorobutadiene															
Hexachloroethane															
N-Nitrosodiphenylamine															
VOLATILE ORGANICS															
Ethylbenzene															
Tetrachloroethene															
Total Zylene (sum of o,m,p)															
Trichloroethane															
PESTICIDES AND PCBs															
Total DDT															
Aldrin															
alpha-Chlordane															
Dieldrin												S			
Heptachlor															
gamma-BHC (Lindane)															
Total PCBs							S	S	S	S	S	SB	SB		
BIOASSAYS															
Amphipod			1H				1H	1H	2H	2H		2H			
Sediment Larval (Bivalve/Echinoderm)	2H	2H	2H	2H	2H	2H			1H		2H	1H			
Neanthes Growth											2H				
Bioassay: (Pass/Fail)	PASS	PASS	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS	FAIL	FAIL	PASS	NA	NA
BTs eyesceded:	no	no	no	no	no	no	no	no	no	no	no	yes	yes	yes	yes
Bioaccumulation test conducted:												no	no	yes	yes
Bioaccumulation (Pass/Fail):														PASS	PASS
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS	FAIL	FAIL	PASS	PASS	PASS
HIGHEST RANKING:	L	L	H*	L	L	L	H*	H*	H*	LM	H*	H*	M	LM	LM

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	USN PIT-CAD CHARACTERIZATION															
DMMU ID:	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury	S	S				S	S		S	S	S	S				S
Nickel																
Silver																
Zinc																
TBT ion (porewater)																
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs																
BIOASSAYS																
Amphipod																
Sediment Larval (Bivalve/Echinoderm)	2H	2H	2H	2H	2H		2H	2H		2H			2H	2H		2H
Neanthes Growth			2H													
Bioassay: (Pass/Fail)	**PASS**	**PASS**	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
BTs eyesceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Bioaccumulation test conducted:																
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	**PASS**	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
HIGHEST RANKING:	LM	LM	H*	L	L	LM	LM	L	LM	LM	LM	LM	L	L	L	LM

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	USN PIT-CAD CHARACTERIZATION														DUWAMISH O&M	
DMMU ID:	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S1	S3
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury	S	S				S	S	S		S	S		S	S		
Nickel																
Silver																
Zinc																
TBT ion (porewater)																SB
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																
Chrysene																
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																
Hexachloroethane																
N-Nitrosodiphenylamine																
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs															S	
BIOASSAYS																
Amphipod																
Sediment Larval (Bivalve/Echinoderm)	2H	2H	2H	2H		2H	2H	2H	2H	2H	2H	2H	2H	2H	2H	
Neanthes Growth															2H	
Bioassay: (Pass/Fail)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	NA
BTs eyesceeded:	no	no	no	no	no	no	no	no	no	no	no	**no**	no	no	no	yes
Bioaccumulation test conducted:																no
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL(C)
HIGHEST RANKING:	LM	LM	L	L	L	LM	LM	LM	L	LM	LM	L	LM	LM	H*	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	DUWAMISH O&M															WEYER
DMMU ID:	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	B1	B2	B1
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury																
Nickel																
Silver																
Zinc																
TBT ion (porewater)	SB (M)											SB				SB
LPAH																
Naphthalene																
Acenaphthene																
Acenaphthylene																
Fluorene																
Phenanthrene																
Anthracene																
2-Methylnaphthalene																
Total LPAHs																
HPAH																
Fluoranthene																
Pyrene																
Benzo(a)anthracene																
Benzofluoranthenes (b+k)																S
Chrysene																S
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
Total HPAHs																
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)																S (U)
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol																
Pentachlorophenol																
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol																
Benzoic acid																
Dibenzofuran																
Hexachlorobutadiene																S (U)
Hexachloroethane																
N-Nitrosodiphenylamine																S (J)
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT																S (U)
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs			S	S	S	S		S	S	S	S	S	S	S	S	S
BIOASSAYS																
Amphipod																2H
Sediment Larval (Bivalve/Echinoderm)									2H						2H	2H
Neanthes Growth		2H		2H	2H			2H						2H	2H	
Bioassay: (Pass/Fail)	NA	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	NA	PASS	PASS	FAIL	FAIL
BTs eyesceeded:	yes	no	no	no	no	no	no	no	no	no	no	yes	no	no	no	yes
Bioaccumulation test conducted:	no											no				no
Bioaccumulation (Pass/Fail):																
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL(C)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL(C)	PASS	PASS	FAIL	FAIL
HIGHEST RANKING:	H*	L	LM	LM	LM	LM	L	LM	LM	LM	LM	H*	LM	LM	H*	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	WEYERHAEUSER CO. HWDG								MANKE LUMBER HWDG							
DMMU ID:	B2	B3	B5	B6	B7	B8	B9	B10	A1	A2	A3	A4	A5	A6	A7	A8
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic									S	S	S	S		S		
Cadmium																
Copper																
Lead																
Mercury														S		
Nickel																
Silver																
Zinc									S			S				
TBT ion (porewater)	SB		SB	SB	SB	SB										
LPAH																
Naphthalene																
Acenaphthene								S							S	
Acenaphthylene																
Fluorene															S	
Phenanthrene								S							S	
Anthracene															S	
2-Methylnaphthalene																
Total LPAHs								S							S	
HPAH																
Fluoranthene								S	S		S		SB		SB	S
Pyrene								S					S		S	
Benzo(a)anthracene								S					S		S	
Benzofluoranthenes (b+k)	S					S							S		S	
Chrysene	S			S		S	S	S	S		S		S		S	
Benzo(a)pyrene																
Indeno(1,2,3-c,d)pyrene	S							S								
Dibenzo(a,h)anthracene			S													S (U)
Benzo(g,h,I)perylene																
Total HPAHs													S		S	
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene																
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)	S (U)	S (U)	S (U)	S (U)			S (U)	S (U)		S (U)	S (U)	S (U)	S (U)	S (U)	S (U)	BM (U)
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol																
4-Methylphenol																
2,4-Dimethylphenol		S (U)	S (U)	S (U)				S (U)			S (U)					
Pentachlorophenol	SB													SB (U)		BM
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol	S (U)		S (U)	S (U)			S (U)	S (U)		S (U)		S (U)	S (U)	S (U)	S (U)	S (U)
Benzoic acid																
Dibenzofuran															S	
Hexachlorobutadiene	S (U)	S (U)	S (U)	S (U)			S (U)	S (U)		S (U)	S (U)	S (U)	S (U)	S (U)	S (U)	SB (U)
Hexachloroethane																
N-Nitrosodiphenylamine	S (U)	S (U)	S (U)	S (U)			S (U)	S (U)		S (U)	S (U)	S (U)	S (U)	S (U)	S (U)	BM (U)
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT	S (U)	S (J)	S (U)			S (U)	S (U)		S (U)		S (UJ)		S (U)	S (U)	S (U)	
Aldrin																
alpha-Chlordane																
Dieldrin																
Heptachlor																
gamma-BHC (Lindane)																
Total PCBs	S		S			S	S		S		S		S		S	
BIOASSAYS																
Amphipod	1H	1H				1H			1H	1H		1H	1H	1H		
Sediment Larval (Bivalve/Echinoderm)	2H					2H	2H	2H	2H		2H	2H	2H	2H	1H	
Neanthes Growth																
Bioassay: (Pass/Fail)	FAIL	FAIL	PASS	PASS	PASS	FAIL	PASS	PASS	FAIL	FAIL	PASS	FAIL	FAIL	FAIL	FAIL	NA
BTs eyesceeded:	yes	no	yes	yes	yes	yes	no	no	no	no	no	no	yes	yes	yes	yes
Bioaccumulation test conducted:	no		yes	yes	yes	no							no	no	no	no
Bioaccumulation (Pass/Fail):			PASS	PASS	PASS											
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes
OVERALL PASS/FAIL:	FAIL	FAIL	PASS	PASS	PASS	FAIL	PASS	PASS	FAIL	FAIL	PASS	FAIL	FAIL	FAIL	FAIL	FAIL(C)
HIGHEST RANKING:	H*	H*	LM	LM	LM	H*	LM	LM	H*	H*	LM	H*	H*	H*	H*	H

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	MANKE LUMBER HWDG														
DMMU ID:	A11	A12	A13	A14	A15	A16	A17	A18	A19	A21	A22	A23	A25	A26	A27
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS															
Antimony															
Arsenic												S	S		
Cadmium															
Copper															
Lead															
Mercury															
Nickel															
Silver															
Zinc													S		
TBT ion (porewater)															
LPAH															
Naphthalene															
Acenaphthene									S						
Acenaphthylene															
Fluorene									S						
Phenanthrene				S					S						
Anthracene									S						
2-Methylnaphthalene															
Total LPAHs															
HPAH															
Fluoranthene				S					S					S	
Pyrene															
Benzo(a)anthracene															
Benzofluoranthenes (b+k)															
Chrysene	S		S	S					S						
Benzo(a)pyrene															
Indeno(1,2,3-c,d)pyrene															
Dibenzo(a,h)anthracene															
Benzo(g,h,I)perylene															
Total HPAHs	S			S					S						
CHLORINATED HYDROCARBONS															
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Hexaclorobenzene (HCB)	S (U)	S (U)	S (U)	SB (U)	S (U)	S (U)	S (U)		S (U)					S (U)	
PHTHALATES															
Bis(2-ethylheyesyl)phthalate															
Butylbenzylphthalate															
Di-n-butylphthalate															
Di-n-octylphthalate															
Diethylphthalate															
Dimethylphthalate															
PHENOLS															
2-Methylphenol															
4-Methylphenol															
2,4-Dimethylphenol					S (U)										
Pentachlorophenol	SB (U)			BM (U)					S (U)						
Phenol															
MISCELANEOUS EXTRACTABLES															
Benzyl alcohol	S (U)	S (U)		S (U)	S (U)		S (U)		S (U)				S (U)		
Benzoic acid															
Dibenzofuran									S (U)						
Hexachlorobutadiene	S (U)	S (U)	S (U)	S (U)	S (U)	S (U)	S (U)		S (U)				S (U)		
Hexachloroethane															
N-Nitrosodiphenylamine		S (U)	S (U)	BM (U)	S (U)	S (U)	S (U)		S (U)				S (U)		
VOLATILE ORGANICS															
Ethylbenzene															
Tetrachloroethene															
Total Zylene (sum of o,m,p)															
Trichloroethane															
PESTICIDES AND PCBs															
Total DDT	S (U)		S (U)	S (U)	S (U)	S (U)	S (U)	S (U)	S (U)		S (UJ)				
Aldrin															
alpha-Chlordane															
Dieldrin	S (U)														
Heptachlor															
gamma-BHC (Lindane)									S (U)						
Total PCBs	S	S	S	S	S	S	S	S	S		S	S		S	S
BIOASSAYS															
Amphipod	2H	1H		1H		1H			2H	1H	1H				
Sediment Larval (Bivalve/Echinoderm)	2H			2H		2H			2H	2H			2H		2H
Neanthes Growth															
Bioassay: (Pass/Fail)	FAIL	FAIL	PASS	FAIL	PASS	FAIL	PASS	PASS	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS
BTs eyesceeded:	yes	no	no	yes	no	no	no	no	no	no	no	no	no	no	no
Bioaccumulation test conducted:	no			no											
Bioaccumulation (Pass/Fail):															
ML Rule exceeded:	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL	FAIL	PASS	FAIL	PASS	FAIL	PASS	PASS	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS
HIGHEST RANKING:	H	H*	LM	H	LM	H*	LM	LM	H*	H*	H*	LM	LM	LM	LM

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	POA-CAP SANTE MARINA			POB-PAD	POT-HYLEBOS/BLAIR SLIP ONE (MOUTH OF HYLEBOS)									(WAS.W)	POT-HYL(MP)	
DMMU ID:	C8	COMP1	COMP2	C1	C2	C4	C9	C10A	C11	C12	C16	C17	C43	C37	C18	C19
Testing Rank:	M	M	M	H	LM	H	LM	LM	LM	LM	LM	LM	H	H	H	H
METALS & ORGANOMETALS																
Antimony																
Arsenic																
Cadmium																
Copper																
Lead																
Mercury								S		S						
Nickel																
Silver																
Zinc																
TBT ion (porewater)		SB	SB					SB (G)		SB (G)				SB (G)		SB (G)
LPAH																
Naphthalene	S					M										
Acenaphthene				S		M										
Acenaphthylene																
Fluorene				S		M										
Phenanthrene				S		M										
Anthracene						S										
2-Methylnaphthalene				S		M										
Total LPAHs				S		M										
HPAH																
Fluoranthene	S			S		BM										
Pyrene	S					M										
Benzo(a)anthracene						M										
Benzofluoranthenes (b+k)						M										
Chrysene	S					S										
Benzo(a)pyrene						BM										
Indeno(1,2,3-c,d)pyrene						M										
Dibenzo(a,h)anthracene						S										
Benzo(g,h,I)perylene						M										
Total HPAHs	S															
CHLORINATED HYDROCARBONS																
1,2,4-Trichlorobenzene								S								
1,2-Dichlorobenzene																
1,3-Dichlorobenzene																
1,4-Dichlorobenzene																
Hexaclorobenzene (HCB)					S (M)	S (U)	S (M)	S	S	S		S (M)				
PHTHALATES																
Bis(2-ethylheyesyl)phthalate																
Butylbenzylphthalate																
Di-n-butylphthalate																
Di-n-octylphthalate																
Diethylphthalate																
Dimethylphthalate																
PHENOLS																
2-Methylphenol						S (U)										
4-Methylphenol																
2,4-Dimethylphenol						S (U)										
Pentachlorophenol						S										
Phenol																
MISCELANEOUS EXTRACTABLES																
Benzyl alcohol						S (U)										
Benzoic acid						S										
Dibenzofuran						M										
Hexachlorobutadiene					S	S (U)	S	S	S	S		S				
Hexachloroethane																
N-Nitrosodiphenylamine						S (U)										
VOLATILE ORGANICS																
Ethylbenzene																
Tetrachloroethene																
Total Zylene (sum of o,m,p)																
Trichloroethane																
PESTICIDES AND PCBs																
Total DDT					S		S	S (NG)	S (NG)	S (NG)	S (NG)	S (NG)		S	S	S
Aldrin											S (U)	S (U)				
alpha-Chlordane											S (U)	S (U)				
Dieldrin								S (Y)	S (Y)	S (Y)		S (U)			S (Y)	S (Y)
Heptachlor											S (U)	S (U)				
gamma-BHC (Lindane)								S	S	S (Y)		S				
Total PCBs						S		S (Y)	S (Y)		S (UE)	S (U)	S	S	S	S
BIOASSAYS																
Amphipod										2H	2H	2H	2H	2H		
Sediment Larval (Bivalve/Echinoderm)							1H	1H	1H	1H	1H	1H			1H	1H
Neanthes Growth								2H	2H							
Bioassay: (Pass/Fail)	PASS	NA	NA	PASS	PASS	NA	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	PASS	FAIL	FAIL
BTs eyesceeded:	no	yes	yes	no	no	yes	no	yes	no	yes	no	no	no	yes	no	yes
Bioaccumulation test conducted:		yes	yes			no		no		no				no		no
Bioaccumulation (Pass/Fail):		PASS	PASS													
ML Rule exceeded:	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	PASS	PASS	PASS	PASS	PASS	FAIL(C)	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	FAIL(C)	FAIL	FAIL
HIGHEST RANKING:	LM	LM	LM	LM	LM	H	H	H	H	H	H	H	LM	H*	H*	H*

APPENDIX C - DY 00/01 EVALUATION GUIDELINE EXCEEDANCES

PROJECT:	POT-HYLEBOS/BLAIR SLIP ONE (MURRAY PACIFIC)									USACE GRAYS H. O&M		
DMMU ID:	C20	C21	C22	C23	C24	C25	C27	C36	C37	C5	C10	C11
Testing Rank:	H	H	H	H	H	H	H	H	H	H	H	H
METALS & ORGANOMETALS												
Antimony												
Arsenic		S										
Cadmium												
Copper												
Lead												
Mercury												
Nickel												
Silver												
Zinc		S										
TBT ion (porewater)	SB	SB (G)		SB (G)	SB (G)				SB (G)			
LPAH												
Naphthalene												
Acenaphthene												
Acenaphthylene												
Fluorene												
Phenanthrene												
Anthracene												
2-Methylnaphthalene												
Total LPAHs												
HPAH												
Fluoranthene					S	SB	S					
Pyrene					S	S						
Benzo(a)anthracene					S	S						
Benzofluoranthenes (b+k)					S	S						
Chrysene	S				S	S	S					
Benzo(a)pyrene												
Indeno(1,2,3-c,d)pyrene												
Dibenzo(a,h)anthracene												
Benzo(g,h,I)perylene												
Total HPAHs					S	S						
CHLORINATED HYDROCARBONS												
1,2,4-Trichlorobenzene												
1,2-Dichlorobenzene												
1,3-Dichlorobenzene												
1,4-Dichlorobenzene												
Hexaclorobenzene (HCB)		S (U)		S (U)							S (U)	
PHTHALATES												
Bis(2-ethylheyesyl)phthalate												
Butylbenzylphthalate												
Di-n-butylphthalate												
Di-n-octylphthalate												
Diethylphthalate												
Dimethylphthalate												
PHENOLS												
2-Methylphenol												
4-Methylphenol												
2,4-Dimethylphenol		S (U)		S(U)							S(U)	
Pentachlorophenol												
Phenol												
MISCELANEOUS EXTRACTABLES												
Benzyl alcohol												
Benzoic acid												
Dibenzofuran												
Hexachlorobutadiene		S (U)		S (U)							S(U)	
Hexachloroethane												
N-Nitrosodiphenylamine		S (U)		S (U)								
VOLATILE ORGANICS												
Ethylbenzene												
Tetrachloroethene												
Total Zylene (sum of o,m,p)												
Trichloroethane												
PESTICIDES AND PCBs												
Total DDT	S	S	S	S (UE)	S (UE)	S (E)	S	S	S			
Aldrin												
alpha-Chlordane												
Dieldrin	S (Y)		S (Y)		S	S (Y)	S					
Heptachlor												
gamma-BHC (Lindane)	S (Y)		S (E)									
Total PCBs	S	S		S	S	S	S	S	S			
BIOASSAYS												
Amphipod						1H			2H			
Sediment Larval (Bivalve/Echinoderm)	1H	1H	1H	1H	1H	2H	2H	1H				
Neanthes Growth												
Bioassay: (Pass/Fail)	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	FAIL	PASS	PASS	NA	PASS
BTs eyesceeded:	yes	yes	no	yes	yes	yes	no	no	yes	no	no	no
Bioaccumulation test conducted:	no	no		no	no	no			no			
Bioaccumulation (Pass/Fail):												
ML Rule exceeded:	no	no	no	no	no	no	no	no	no	no	no	no
OVERALL PASS/FAIL:	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	PASS	FAIL	FAIL(C)	PASS	PASS (BPJ)	PASS
HIGHEST RANKING:	H*	H*	H*	H*	H*	H*	LM	H*	H*	L	LM	L